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WILLIAM HENRY DUKE OF PORTLAND.

K. G. F. R. and A. S.

Late a Vice President of the Society for the Encouragement of Arts, Manufactures & Commerce.

Drawn & Engraved by Wm. Evans, from an original Painting by Sir Joshua Reynolds in the Possession of the present Duke of Portland.

16766

TRANSACTIONS

OF THE

SOCIETY,

INSTITUTED AT LONDON,

FOR THE

ENCOURAGEMENT

OF

ARTS, MANUFACTURES, AND COMMERCE;

WITH THE

PREMIUMS offered in the Year 1810.

VOL. XXVIII.

LONDON:

PRINTED BY R. WILKS, CHANCERY-LANE.

Sold by the HOUSEKEEPER, at the SOCIETY'S HOUSE, in the ADELPHI; and by Messrs. ROBSON, J. WHITE, BECKET, JOHNSON, CADELL and DAVIES, PHILLIPS, WALTER, RICHARDSON, LONGMAN and REES, TAYLOR, and WYATT.

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PREFACE.

AMIDST the troubles occasioned by the horrors of war, which have interrupted or destroyed most of the Societies established in various parts of the Continent of Europe for the promotion of useful inventions, the Society instituted at London for the Encouragement of Arts, Manufactures, and Commerce, still continues to flourish and to extend its beneficial influence throughout the habitable world.

The present Volume of their Transactions will evince the unremitting attention paid by the Members of this Society to the great objects of their Institution, and the numerous valuable Engravings, with which this volume is enriched, will prove that the Society is not sparing of expense in elucidating the subjects of its rewards.

The Society ever solicitous to express its gratitude to such of its distinguished Members as have honored it with their more immediate patronage by filling its highest offices, have, with the permission of his Grace the present Duke of Port-

land, caused an elegant and correct likeness of the late Duke of Portland, engraved from a painting by Sir Joshua Reynolds, to be prefixed to this Volume. He was forty-seven years a contributing Member of five Guineas a-year to the Society, and was elected to the office of Vice President in March 1794. His Grace died on the 30th of October, in the seventy-second year of his age.

Agriculture in all civilized states naturally demands every possible encouragement, and no session of the Society has yet elapsed without its rewards and bounties having called forth the exertions of many patriotic and ingenious individuals in the different departments connected with that most important branch of public welfare.

The great labor and expense attendant upon the thrashing of corn and grain by the hand, have occasioned many experiments to be made for the execution of that work by machinery, and various machines have been constructed for such purpose, over all of which, however, from the very respectable testimonies adduced, it appears that the Thrashing-Machine, invented by H. P. Lee, Esq. of Maidenhead Thicket, lately rewarded, possesses great advantages, as well from its simplicity of construction, and the ease with which it can be worked by two horses, as from its cheapness, and the facility with which the operation is performed by it.

Thomas

Thomas Johnes, Esq. of Hafod, in Cardiganshire, has lately added 300,000 larch trees, 30,000 beech, and 10,000 spruce firs, to his former extensive plantations. This gentleman, as an agriculturist, may be considered the greatest benefactor, both by precept and example, that part of the country has ever known. Before he sowed wheat in Wales a rooted prejudice had obtained, that it could not grow there; but under his fostering influence, an immense extent of land, heretofore regarded as barren, has produced flourishing crops of that and other species of corn. To ascertain the growth and increase of the girths of timber at certain periods is very desirable, and it is particularly wished by the Society that gentlemen who have planted many trees, would furnish communications similar to those of Mr. Johnes on this subject.

John Christian Curwen, Esq. of Workington, in Cumberland, ranks high as a patron of agriculture in all its branches: a detail is given in the present volume of his accurate Experiments on the different Breeds of Cows, with a view to ascertain the particular breed which can be best fed at the least expense. It is a favourite idea with Mr. Curwen, that the riches and power of a nation depend principally upon agriculture; and he appears to have verified this opinion by the wonderful advantages which he has produced in the county of Cumberland. As a practical farmer he has grown, upon an estate held in his possession, upwards

of £. 6000 worth of corn in one year; and has furnished to the poor, within the same period, from his own cows, more than 17,410 quarts of milk, and sold the new milk at 2*d.* per quart, and skim milk at 1*d.* wine measure; and as a planter he has planted more than 1,000,000 of timber trees in the course of twelve months.

The value of Pinaster Fir Trees, as Timber seems hitherto to have passed almost unregarded: a very interesting communication will be found from J. Berney Petre, Esq. of Norfolk, on this subject. From his account and specimen produced it appears that this wood is much more deserving of notice than it has ever yet obtained; and when the beauty of its foliage, its rapid growth, and the peculiar property it possesses of flourishing on poor lands near the sea-coast, are considered, it will naturally claim, and amply repay public attention. Mr. Petre's establishment of a Chamomile Ground, which furnishes employment to the poor, and a most valuable article to our *Materia Medica*, is too important a circumstance to pass without commendation.

It has been generally remarked, that the sea which environs our island makes frequently great encroachments on many parts of our coast; it is pleasing, however, to ascertain, that by the joint exertions of Mr. Stockdale and Mr. Towers, upwards of five hundred and sixty-four acres of land have been rescued from its ravages; and the means by which the

object

object was effected are accurately described, and will enable proprietors of land on the sea-coast to preserve and even to extend their possessions.

Improvements in the Construction of the Plough, that implement of primary importance in agriculture, have much occupied the minds both of theoretical and practical agriculturists. We observe some difference in the form and construction of the ploughs of almost every county, owing to the variety of soils, pecularity of situation, or some accidental circumstances or prejudices. The plough invented by Mr. Thomas Balls, of Saxlingham, possesses the double advantages of a Wheel, and Swing Plough, and of cutting the furrow of any particular depth which the farmer may desire, even when he is not personally present, after he has once fixed it for use.

The mischief arising from the luxuriant Growth of Docks and Thistles, on land of every description, it is hoped, will be in a great degree prevented by the ingenious implement invented by Mr. J. Baker.

Mr. William Jeffery has invented a very ingenious contrivance of expanding Harrows, which are so formed as to open or contract as the nature of the land may require. From respectable Certificates, it appears that these Harrows may be advantageously used on all kinds of land, from the

most stubborn soils to the finest tilth; and when not in use may be conveniently folded up and preserved.

Much has been advanced by different agriculturists, respecting the comparative merits of the Reaping Hook and the Sickle, in cutting corn, and a considerable quantity of grain is annually wasted from the defect of the instruments, or their mismanagement. A Reaping Hook lately contrived by Mr. Joseph Hutton, Jun. appears to possess the joint advantages of the two implements.

Under the Class of Chemistry it will be seen, that this Society, attentive to the policy which they have ever had in view of supplying our wants or embellishments, with the products of our own kingdom, or those of the United Empire, have, in the article of Marble, endeavoured to prevent the apparent necessity of sending large sums of money annually from hence for the purchase of foreign marble; and the various specimens of beautiful marbles produced from quarries in England, Scotland and Ireland, by Mr. Hubbard, (as in our last Volume), and by the exertions of Mr. Jopling, the Dublin Society, and Alexander Mitchell, Esq. (as recorded in the present), ascertain the great success of their endeavours.

The heat, light, and products from Pit Coal, have for a few years past engaged much of the public notice. Few

persons

persons seem to have paid such minute attention to the subject as Mr. B. Cook, of Birmingham, who has furnished the Society with specimens of Asphaltum, and substitutes for Oil of Turpentine, also specimens of Varnish prepared from these articles, forming Japanned Work of a superior stile of excellence; and has given a minute account of the methods he has employed in procuring from Pit Coal these products.

The great difficulty which lately occurred of obtaining Turpentine from America, and the high price to which this article had risen, stimulated the active and patriotic mind of Mr. H. B. Way, of Bridport Harbour, to endeavour to procure it in England from Firs of British growth; the Society have received from him specimens procured from them in the manner of that collected in America, along with many excellent remarks on the subject, which, it is hoped, will call forth the attention of persons possessed of large fir-plantations, and induce them to make extensive exertions in this line, for their own emolument and the public benefit.

The Rewards bestowed this Session, under the Class of Polite Arts, will probably create a spirit of emulation in the minds of those young artists to whom they have been given. Many artists, deservedly of high reputation in this country, arose to fortune and to fame from the spark of genius kindled in their breasts in their youthful days, by the applause of this Society. Amongst other important duties, the

the Society have directed their attention to the improvement of female accomplishments, and afford to the Fair Sex pleasing and elegant amusements.

The easy and expeditious improvement in the Aquatinta Process, for which Mr. Hassell has been rewarded, possesses many advantages which would have appeared in a much more favourable point of view, and probably tended much to his emolument, if Mr. Hassell could have been prevailed upon to have elucidated his method by an explanatory sketch in this Volume.

The preparation of Ox Gall, for the use of painters, by Mr. Cathery, will be found useful, and prevent the noxious effects which have frequently arisen from the use of gall in a putrid state. In some cases it will also be found an article of economy for employment in manufactures.

Under the Class of Manufactures are inserted many interesting experiments by Mr. E. Smith, of Brentwood, Essex, upon the Fibres of the common Nettle. He has proved that this plant readily furnishes substitutes for hemp, flax, linen, tow and cotton; and that the thread made from Nettle-fibres possesses properties equal to those of the best flax. An instructive lesson is thus conveyed of the bounty of Providence, in furnishing, from a neglected weed, such valuable products.

By

By J. Sholl's improvement in the art of weaving Figured Silks, the work can be better executed, and with less time and expense, as may be seen from the numerous Certificates in its favor.

The beautiful Figured Napkin, executed by Mr. Lockett, is superior in design, and equal in quality to the best German figured linens which have been generally held in high estimation, and imported into this country at a great expense.

By Mr. Corston's communication, it very satisfactorily appears, that the Gold Medal of the Society conferred upon him in the year 1805, has promoted the desired object of effectually establishing the Manufacture of Leghorn Plait in this kingdom, and of affording employment very extensively to young children and the superannuated poor of both sexes.

The Class of Mechanics exhibits a very great number of useful inventions, produced this Session to the public. In the Rev. J. Bremner's communication of his method of making any Ship's Boat a Life Boat, to preserve the crew from imminent danger, we consider with pleasure the philanthropy of his heart, which induced him, with so small a portion of worldly means, to undertake so arduous a task; we contemplate, with surprize, the perseverance and unremitted attention which he exerted in effecting the object;

and

and we admire the ingenuity, efficacy, and simplicity of the means by which he has effected it. In the hour of distress and danger the blessings of many an unfortunate person, rescued from a watery grave, will attend his efforts in the cause of humanity.

The improved Mooring Block for Ships, invented by Mr. Hemman, is of great importance; both in giving greater security to our ships, and procuring that security by a method much less expensive, and with greater certainty than by the modes heretofore adopted.

The combination of Portable Ladders invented by Mr. Davis, to preserve persons and property from fire, and which is easily conveyed and applied, will, it is hoped, prevent the recurrence of many affecting accidents which have lately happened, of persons perishing by fire, in their chambers, for want of proper and timely assistance. This apparatus demands the attention of every parish, from the advantages it possesses of portability, certainty in application, and the security which it affords to the weak and infirm.

To a nation like our's, dependant upon commerce, the improvement of Nautical Instruments will ever be a primary consideration; by means of the Mathematical Dividing Wheel,

Wheel, produced by Mr. J. Allan, the instruments used in navigation will be formed with more accuracy and at less expense than formerly, and the scales of mathematical instruments in general be made more correct.

The Tachometer, or Apparatus invented by Mr. B. Donkin, for ascertaining the velocity of Machines of various descriptions, shows by simple inspection, when once regulated, whether their motions are proper, or whether they are irregular, quicker, or slower than what is desired.

In many extensive manufactories motion is communicated to the machinery by means of leathern straps, and it is therefore of importance that their breadths and thicknesses should be correct and uniform when so applied; to effect which the Instruments lately invented by Mr. L. Aubrey will be found very competent.

The use of cocks for drawing-off liquors of every description is well known, and it is of consequence to have them accurately formed. Mr. E. Williams's Machine for boring them is very ingenious and effectual.

Mr. E. Baker has lately made great improvements in Fire-Arms, particularly in Pistols, which he has rendered more safe to the bearer, and more effectual in use than those

formerly

formerly employed by the cavalry; and we find that these improvements have met with the sanction and approbation of persons of great experience.

The process of separating iron-filings from their admixture with those of other metals is in the common way a very tedious operation, but upon the principle practised by Mr. Ross is easily effected.

Shocking accidents have frequently occurred to painters and glaziers employed on the outside of windows, or to persons who clean them; a Sash, lately invented by Mr. G. Marshall, will be free from such dangers, as upon this principle both the top and bottom sash-sheets will admit of their outsides being easily turned within the room, to clean or repair, and their motions of lifting up and down in the usual way at the same time preserved.

Pure water is always desirable; by Mr. W. Moult's application of the Filtering-Stone, in such a manner as to allow water to pass through it from without, instead of the water being poured into it to filter in the common way, it is shown by the Certificates of several respectable Gentlemen, that the water will be more pure, and furnished in larger quantities, and the stone continue longer clean, than when dripped through, as by the common filtering-stone.

The

The eye is frequently struck and the mind shocked with the view of a poor horse thrown down upon the pavement in the public streets in the shafts of a loaded cart, and struggling in agonies beneath it; Mr. B. Smith has invented a very simple and easy Method of raising the cart, and relieving a horse from such a miserable situation.

Great danger has arisen, and many lives been actually lost from foul air of different kinds remaining stagnant in mines; Mr. J. Taylor has contrived an easy Method of extracting the Foul Air at the distance of more than a thousand yards from the place where the apparatus is fixed, and of supplying the miners with Fresh Air upon a cheap plan, applicable to the purpose also of ventilating ships and hospitals.

Mr. Adam Reid has invented a Compensation Pendulum for a Clock, made by adjustments of zinc and steel, so as to counteract its dilatation by heat or contraction by cold, and thus procure a regular motion of the pendulum, and make the clock keep true time.

An ingenious contrivance for knowing the hour in the dark, by a cheap apparatus in which a common watch is placed, has been produced by Mr. George Spark, and termed by him a Noctuary.

The

The infirmities of the human body are more diversified, and operate to a greater extent than are generally known or conceived. To alleviate the many diseases and accidents to which the human frame is liable, the Society have, in several instances, extended their vigilance during the present session, as the following statements will evince.

Mr. J. Whitford has been rewarded for an ingenious Truss for Inguinal Ruptures, which adapts itself to the particular form of the body, to fit close and firm.

A Silver Medal has been given to Mr. G. Prisley, for his construction of Spring-Crutches for Invalids, which assist them to walk with greater certainty, safety and ease.

A very extraordinary instance of the efforts of human genius to remedy one of the most serious misfortunes in life has been exemplified by the exertions of Mr. J. Morison, who unfortunately lost both his hands and part of his arms in firing off a cannon on the King's birth-day. Great acuteness of mind and firmness of character have enabled him to overcome difficulties which might naturally have been supposed insurmountable, and he has not only been the means of procuring many comforts to himself by his ingenious inventions for supplying the want of hands and arms, but of establishing a business by which he has the

power

power of contributing greatly to the happiness of others who have met with similar accidents. The following honorable Certificate, in favor of Mr. Morison, which was received too late for insertion in the body of the Volume, is of too much consequence to neglect notice here, or to require an apology for its introduction.

Chelsea Hospital, Feb. 5, 1811.

" We certify, that we have examined the instruments that have been submitted to our inspection, and which, as we are informed, were invented by John Morison for supplying the loss of both hands and arms; that we approve of the same, and recommend him as a person who deserves encouragement.

" T. KEATE, WILLIAM BLIZARD,
" G. CHANDLER, WILLIAM NORRIS,
" H. CLINE, Jun. JAMES WARE."

The Class of Colonies and Trade exhibits pleasing accounts of improvements of great consequence to our trade and commerce, and of the resources which may be derived from our colonies, both in the East and West Indies.

The manufacture of Nerium Indigo, fully detailed by Dr. William Roxburgh, exhibits many curious circumstances attending the process, a consideration of which will be very important to dyers of silk, cotton and linen. So short a period back as the year 1788, the quantity of Indigo imported

ported from the East Indies was very small in comparison with the immense quantities we then procured from Spain and France. The rapid increase of its manufacture in the East Indies arose from a memorial delivered to the late Right Hon. William Pitt by our present Secretary, which called that Minister's attention to the importance of the subject, and was printed and circulated in India by order of the Right Hon. the Lords of the Committee of the Privy Council for Trade and Plantations.

To Dr. Roxburgh the public are greatly indebted for many valuable discoveries. The Swietania Fever Bark; the cheap substitute for pitch and tar; the articles now recommended by him for tanning; and his additions to our *Materia Medica*, are well deserving of attention and extensive experiment.

Dr. Anderson, of the Royal Botanical Garden at St. Vincent, has, with his usual assiduity attended to every advantage he could possibly procure there for the interest of our West India colonies, and that of this country.

From him has been received the confirmation of the great success of the method, recommended by Mr. Salisbury in the 27th Volume of Transactions, for preserving in packages of the Moss, called Sphagnum Palustre, various plants and trees when exported to foreign countries.

The

The Society have not recorded any of their communications from Canada, as they contain only general, but at the same very satisfactory accounts of the flourishing state of those Provinces, and of the great quantities of timber (similar to that formerly supplied from the Baltic,) now constantly arriving from Canada, equally to the substantial benefit of the mother country and to the disappointment of her enemies.

The present Volume has been longer delayed in publishing than could be wished, owing to the Engravings it contains, which are much more numerous than in any former Volume, and which have required more time to execute; the Society being always anxious to convey to the public, in a clear and explicit manner, the subjects they communicate.

The acknowledgments of the Society are due as well to several public bodies as to individuals for presents lately received, and which will be found noted in this Volume. Alexander Mitchell, Esq. with his usual public spirit, has ornamented the Rooms of the Society with some excellent Prints, and made several valuable additions to the Library.

The Society desire it to be clearly understood, that, as a body, they are not responsible for any opinion or representation of facts contained in the following pages. They have endeavoured only to compress, into a form more concise, such communications as appeared to them too diffuse when received.

Adelphi, London,
Feb. 27, 1811.

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PREMIUMS

OFFERED IN THE YEAR 1810,

BY THE SOCIETY

INSTITUTED FOR THE ENCOURAGEMENT

OF

ARTS, MANUFACTURES, AND COMMERCE.

R. Wilks, Printer, 89, Chancery-lane.

The Meetings of the Society are held at their House in the Adelphi, London; and the Consideration of the Claims, offered in the present List, will take place during the Session of the Society, commencing on the 24th of October, 1810.

PREMIUMS offered in 1810, *by the* SOCIETY *instituted at* London, *A. D.* 1754, *for the Encouragement of Arts, Manufactures, and Commerce, with a List of the present Officers.*

PRESIDENT.

Charles, Duke of Norfolk, F. R. and A. S.

VICE-PRESIDENTS.

John Duke of Bedford.
Hugh, Duke of Northumberland, F. R. and A. S.
G. G. L. Marquis of Stafford, K. G.
Jacob, Earl of Radnor, F. R. and A. S.
Charles, Earl of Romney, F. R. S.
Charles, Earl of Dartmouth, K. G. and F. R. S.
John, Lord Henniker, F. R. and A. S.
Hon. Robert Clifford, F. R. and A. S.
Sir William Dolben, Bart. L. L. D.
Sir Robert Peel, Bart. M. P.
Sir Watkin Lewes, Knt.
Thomas Pitt, Esq. F. A. S.
Richard Clark, Esq. Chamberlain.
Nathaniel Conant, Esq.
Richard Powell, M. D.
John Christian Curwen, M. P.

CHAIRMEN OF COMMITTEES.

Accounts.

William Lumley, Esq.
Abraham Osorio, Esq.

Correspondence and Papers.

William Tooke, Esq.
Edward Bancroft, M. D.

Polite Arts.

J. T. Barber, Esq.
John Chambers, Esq.

Agriculture.

Matthias Deane, Esq.
T. H. Andrew, Esq.

Manufactures.

J. Pearsall, Esq.
J. Trelawney, Esq.

Mechanics.

J. Kenworthey Cooke, Esq.
Thomas Gill, Esq.

Chemistry.

Henry Coxwell, Esq.
G. D. Midgley, Esq.

Colonies and Trade.

William Lewis, Esq. F. L. S.
R. H. Solly, Esq. F. R. & A. S.

Miscellaneous Matters.

William Kirkby, Esq.
Daniel Beaumont, Esq.

SECRETARY, Charles Taylor, M. D.
ASSISTANT SECRETARY, Mr. Thomas Woodfall.
HOUSEKEEPER, Miss A. B. Cockings.
COLLECTOR, Mr. Robert Elwin.

ADVERTISEMENT TO THE PUBLIC.

THE chief objects of the SOCIETY are to promote the Arts, Manufactures, and Commerce of this Kingdom, by giving honorary or pecuniary Rewards, as seem to them best adapted to the case, for all such useful Inventions, Discoveries, and Improvements, (though not mentioned in this book) as tend to that purpose; and, in pursuance of this plan, the Society have already expended many THOUSAND POUNDS, advanced by voluntary subscriptions of their members, and legacies bequeathed.

The Register of the Premiums and Bounties they have given, which may be seen at the SOCIETY's house in the *Adelphi*, will show the very great advantages which the Public have derived from this Institution.

The meetings of the SOCIETY are held every *Wednesday*, at seven o'clock in the evening, from the fourth *Wednesday* in *October* to the first *Wednesday* in *June*. The several Committees meet on other evenings in the week during the session, as particularly mentioned in their printed book of Rules and Orders.

In order still farther to promote the laudable Views of the SOCIETY, it may be necessary to explain the mode by which members are elected.

Each member has the privilege, at the meetings of the SOCIETY, or by letter to the Secretary, to propose any person who is desirous to become a member, provided the proposal contains the name, with the full addition, and place of abode, of the proposed member, and is signed by three members of the SOCIETY.

Peers of the Realm or Lords of Parliament are, on their being proposed, immediately balloted for; the names of other persons proposed to become Members are to be delivered to the Secretary, read at the next meeting of the SOCIETY, and then inserted in lists which are hung up in the Society's room: they are balloted for at the second following ordinary meeting. In both cases, if two-thirds of the members then voting ballot in their favour, they are deemed perpetual members upon payment of not less than Twenty Guineas in one sum, or subscribing members upon payment of any sum not less than Two Guineas annually.

All members are entitled to vote and assist in all the business of the SOCIETY, and the several Committees. The members have also the privilege of recommending two persons as auditors at the meetings of the SOCIETY, and by addressing a note to the housekeeper, of introducing their friends to examine the various Models, Machines, and Productions, in different branches of Arts, Manufactures, and Commerce, for which rewards have been bestowed; also to inspect the magnificent series of moral and historical Paintings, executed by the late J. BARRY, Esq. which, with some valuable Busts, Statues, &c. decorate the Great Room.

Members have the use of the Society's Library, which is valuable and annually increasing, from donations of scientific and useful books and engravings. The SOCIETY are highly sensible of the great importance of such acquisitions, and are happy to record them, with the names of the donors, in the Volume annually published of the SOCIETY's Transactions, to which the members are entitled.

Ladies are eligible, as members of the SOCIETY, to all the Privileges thereof, and are alone entitled to vote by proxy at elections, through the medium of any gentleman who is a member, on his producing a written authority for the same.

The time appointed for admission to the Paintings or Models, is from ten to two o'clock, Sundays and Wednesdays excepted.

ORDERED, SOCIETY'S HOUSE, ADELPHI, JUNE 1st, 1810.

That the several Candidates and Claimants, to whom the Society shall adjudge Premiums or Bounties, do attend at the Society's House, in the Adelphi, on the last Tuesday, in May, 1811, at Eleven o' Clock in the Morning precisely, to receive the same; that Day being appointed by the Society for the Distribution of their Rewards: And before that time no Premium or Bounty will be delivered, except to those who are about to leave the Kingdom.

In cases where the Society may think fit to admit excuses for not attending in person, deputies may be substituted to receive the Rewards, provided such Deputies are either Members of the Society, or superior Officers thereof.

PREMIUMS IN AGRICULTURE.

Article 1. Acorns.

FOR having set between the first of October, 1808, and the first of April, 1809, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions; the silver medal.

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the first Tuesday in December, 1810.

3. Raising Oaks. To the person who shall have raised, since the year 1806, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns, in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates that there were on the land, at least the number of young oak trees required, in a thriving condition, two years after the planting, with an account of the methods pursued in making and managing the plantation, to be produced to the Society on or before the first Tuesday in January, 1811.

5. Ascertaining the best Method of raising Oaks. To the person who shall ascertain in the best manner, by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or tilled, from acorns set by the spade or dibble without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover: or from young plants previously raised in nurseries, and transplanted; regard being had to the expense, growth, and other respective advantages of the several methods; the gold medal.

The *accounts* and proper *certificates*, that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in November, 1810.

6. Chesnuts. For having sown or set, between the first of October, 1808, and the first of April, 1809, the greatest quantity of land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

7. For the second greatest quantity, not less than four acres: the silver medal.

Certificates of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in January, 1811.

8. Elm. For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1808, and the twenty-fourth of June, 1809; and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

9. For the second greatest number, not less than five thousand; the silver medal.

Certificates of having planted agreeably to the above conditions, that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1811.

10. Larch. For having planted out, between the twenty-fourth of June, 1807, and the twenty-fourth of June, 1808, the greatest number of larch trees, not fewer than five thousand, and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

11. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in December, 1810.

N. B. The larch trees may be planted, either mixed with other trees, or by themselves, as may best suit the convenience of the Planter.

12. Ash. For having sown or set, in the year 1806, the greatest quantity of land, not less than six acres, with ash for timber, with or without seed, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

13. For the next greatest quantity, not less than four acres; the silver medal.

Certificates of the sowing or setting, agreeably to the above conditions, that there are not fewer than six hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in December, 1810.

N. B. It is the intention of the Society, that such lands only as are not calculated for the purposes of Husbandry, should be employed for the purposes specified in these advertisements.

14. Forest trees. To the person who shall have enclosed and planted, or set, the greatest number of acres (not less than ten) of land, that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to repay the expense of tillage, owing to the surface be

ing too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest trees, namely, oak, Spanish chesnuts, ash, elm, beech, alder, willow, larch, spruce, and silver fir, with or without screens of Scotch fir, adapted to the soil, and intended for timber trees, between the first of October, 1807, and the first of April, 1808; the gold medal.

15. For the second greatest quantity of land, not less than seven acres: the silver medal.

A particular *account* of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper *certificates* that they were in a healthy and thriving state two years at least after making the plantation, to be delivered to the Society on or before the first Tuesday in December, 1810.

N. B. With the above forest trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

16. Norway Fir Seedlings. To the person who shall have planted in the united kingdom, during the year 1810, the greatest number, not less than two thousand, of red wood and white wood, Norway fir seedlings, at sufficient distances from each other, to stand for timber trees; the gold medal.

Certificates of the number of plants, that they were in a thriving state two years at least, after they were planted out, with a general account of the method used in making the plantation, to be delivered to the Society, on or before the first Tuesday in December, 1813.

N. B. It is recommended to plant the seedlings of about three or four years growth, and in a moderately good soil, somewhat sheltered; the wood from the district of Christiania is esteemed the best for carpenters and joiners use; and for spars and upers the trees near to Long Sound, are most valued.

17. Walnut Trees. For having planted the greatest number of walnut trees, not less than one thousand, between the 24th of June, 1808, and 24th of June, 1809, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

18. For the next greatest number, not fewer than five hundred; the silver medal.

Certificates of having planted agreeably to the above conditions, and that the plants were in a healthy and thriving state, two years at least after making the plantations, and specifying the distance of the plants from each other, to be delivered to the Society, on or before the first Tuesday in April, 1811.

The candidates for planting all kinds of trees are to produce certificates that the respective plantations are properly fenced and secured, and particularly to state the condition of the plants at the time of signing such certificates. Any information which the candidates for the foregoing premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations that may have occurred on the subject, will be thankfully received.

19. Securing Plantations of Timber Trees, and Hedge Rows. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber trees, and hedge rows, from hares and rabbits, as well as sheep and large cattle, which at the same time shall be least subject to the depredations of wood-stealers; the silver medal.

The *accounts*, and *certificates* of the efficacy of the method, to be produced to the Society on or before the first Tuesday in December, 1810.

20. Comparative Culture of Wheat, broad-cast, drilled, and dibbled. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal.

It is required that every operation and expense of each mode of culture be fully described: and that proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1811.

21. Beans and Wheat. To the person who shall have dibbled or drilled between the first of December, 1809, and the first of April, 1810, the greatest quantity of land, not less than ten acres, with beans, in equidistant rows, and hoed the intervals twice or oftener, and shall have sown the same land with wheat in the autumn of the year 1809; the gold medal.

It is required that an *account* of the sort and quantity of beans, the time of dibbling or drilling, and of reaping or mowing them, the produce per acre thrashed, the expense of dibbling or drilling, hand or horse hoeing, the distance of the rows, and the quality of the soil, together with *certificates* of the number of acres, and that the land was afterwards actually sown with wheat, be produced on or before the second Tuesday in March, 1811.

22. Beans. To the person who, in the year 1808, shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick-beans, that will ripen their seeds before the 21st of August; the silver medal.

It is required that a particular account of the bean, the cultivation, and the expense attending it, with proper *certificates* of the

nature and condition of the land on which the experiments were made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the first Tuesday in December, 1810. It is apprehended that if a bean should be brought into cultivation with the habits of the hotspur, or other early peas, that it would in a great measure escape the danger arising from the collier-insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat. The *accounts* and *certificates* to be delivered on or before the first Tuesday in December, 1810.

23. Parsnips. To the person who in the year 1809, shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the sole purpose of feeding cattle or sheep; the gold medal.

Certificates of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the second Tuesday in February, 1811.

24. Buck Wheat. To the person who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal.

It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1811.

25. For the next greatest quantity, not less than fifteen acres, on similar conditions: the silver medal.

Information respecting its application to the feeding of cattle, hogs, and poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.

26. Bees, Wax, and Honey. To the person who shall erect, previous to the first day of September, 1810, an apiary containing the greatest number of hives or boxes stocked with bees, not less than thirty; the silver medal or twenty guineas.

27. For the next greatest number, not fewer than twenty stocks; ten guineas.

Proper *certificates* of the number of stocks, and that they have been in the possession of the claimant during the preceding summer, to be produced to the Society on or before the first Tuesday in March, 1811.

28. Raising Grass Seeds. To the person who shall raise the greatest quantity of each of any of the following named grass seeds. *viz.*—Meadow fox-tail (alopecurus pratensis), sweet-scented vernal grass (anthoxanthum odoratum), Timothy grass (phleum pratense), meadow fescue grass (festuca pratensis), smooth-stalked meadow grass (poa pratensis), rough-stalked meadow grass (poa trivialis); the silver medal.

It is required that *certificates* from persons who have viewed them in a proper state, to identify that they are one or other of the seeds above-mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of February, 1811.

29. Preserving Turnips. To the person who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

It is required that a full and accurate *account* of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least have been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the first Tuesday in December, 1810.

30. For the next in quantity and merit, on not less than two acres; the silver medal.

31. Preserving Cabbages. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

32. For the next in quantity and merit, on not less than two acres; the silver medal.

Conditions the same as for preserving turnips, Art. 27.—And the *accounts* to be produced on or before the first Tuesday in December, 1810.

33. Preserving Carrots, Parsnips, or Beets. To the person who shall discover to the Society the best and cheapest method of preserving carrots, parsnips, or beets, perfectly sound, and in every respect fit for the purpose of supporting horses, and fattening sheep and neat cattle, during the

months of February, March, and April; the gold medal.

Conditions the same as for preserving turnips, Art. 27. And the *accounts* to be delivered in on before the first Tuesday in December, 1810.

34. For the next in quantity and merit, on not less than two acres: the silver medal.

35. PRESERVING POTATOES. To the person who shall discover to the Society the best and cheapest method of preserving potatoes, two or more years, perfectly sound, without vegetating, and in every other respect fit for the purpose of sets and the use of the table, and consequently of supporting and fattening cattle; the gold medal, or thirty guineas.

It is required that a full and accurate *account* of the method employed, and the expense attending the process, with *certificates* that one hundred bushels at the least have been preserved according to the method described, and that one or more bushels of the same potatoes have been set, and produced a crop without any apparent diminution of their vegetative power, and also that they have been used at table, with entire satisfaction to the person who eat of them, together with a sample of one bushel, be sent to the Society on or before the first Tuesday in December, 1810.

36. For the next greatest quantity, not less than fifty bushels; the silver medal.

37. MAKING MEADOW-HAY IN WET WEATHER. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow-hay in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in January, 1810.

38. HARVESTING CORN IN WET WEATHER. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced on or before the first Tuesday in January, 1811.

39. GAINING LAND FROM THE SEA. To the person who shall produce to the Society an account, verified by actual experiment, of his having gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain or Ireland; the gold medal.

Certificates of the quantity of land, and that the experiments were begun after the first of January, 1804, to be produced to the Society on or before the last Tuesday in November, 1810.

40. The same premium is extended one year farther.

Certificates to be produced on or before the last Tuesday in November, 1811.

41. IMPROVING LAND LYING WASTE. For the most satisfactory *account* of the best method of improving any of the following soils, being land lying waste or uncultivated, *viz.* clay, gravel, sand, chalk, peat-earth, or bog, verified by experiments on not less than fifty acres of land; the gold medal.

42. For the next greatest quantity, not less than thirty acres; the silver medal.

It is required, that the land, before such improvement, be absolutely uncultivated, and in a great measure useless, and that, in its improved state, it be enclosed, cultivated, and divided into closes.

Certificates of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1811.

43. MANURES. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as top-dressings on grass and corn land, *viz.* soot, coal-ashes, wood-ashes, lime, gypsum, night-soil, or any other fit article; the gold medal. It is required that the above experiments be made between two or more of the above-mentioned manures, and that no less than two acres of land be dressed with each manure.

An *account* of the nature of the soil, quantity, and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1811.

44. RAISING WATER FOR THE IRRIGATION OF LAND. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to, and cheaper than any other method now in use; the gold medal, or fifty guineas.

A model, on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it was raised, to be produced to the Society on or before the first of March, 1811.

45. PARING PLOUGH. To the person who shall invent and produce to the Society

a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known, or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty-guineas.

The machine, and *certificates* that at least three acres have been pared by it in a proper manner, to be produced to the Society on or before the first of January, 1811.

46. Machine for Dibbling Wheat. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths; the silver medal and ten guineas.

The *machine*, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in January, 1811.

47. Machine for Reaping or Mowing Corn. For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner that it may be easily gathered up for binding; the gold medal.

The *machine*, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1810. Simplicity and cheapness in the construction of this and the preceding machine, will be considered as principal parts of their merit.

48. Thrashing Machine. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal.

The *machine*, or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1811.

49. Destroying the Grub of the Cockchafer. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal.

The *accounts*, with proper *certificates*, to be produced on or before the first Tuesday in January, 1811.

50. Destroying Worms. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying worms, or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the silver medal.

The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1811.

51. Destroying the Fly on Hops. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop ground; the gold medal.

Accounts and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1811.

52. Preventing the Blight, or Ravages of Insects, on Fruit-Trees and Culinary Plants. To the person who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the silver medal.

The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in December, 1810.

53. Cure of the Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal.

It is expected that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the Society on or before the first Tuesday in February, 1811.

54. Cure of the Foot-Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the foot-rot in sheep; the silver medal.

It is required that the cure be ascertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates* delivered to the Society on or before the first Tuesday in February, 1811.

55. Preventing the ill Effects of Flies on Sheep. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal.

It is required that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in December, 1810.

56. Protecting Sheep. To the person who, in the year 1809, shall protect the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means, and give the most satisfactory ac-

count, verified by experiment, of the advantages arising from the practice of protecting sheep from the inclemency of the weather, by hovels, sheds, or any other means; the gold medal.

A particular *account* of the experiments made, with the advantages arising therefrom, together with the expense, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1811.

N. B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

57. Culture of Hemp. The Society wishing to encourage the growth of hemp for the use of the navy in every part of the united Empire, offer to the person who shall sow with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in any part of the united Empire, not less than fifty acres statute measure, in the year 1810, and shall at the proper season cause to be plucked the summer hemp, (or male hemp bearing no seed) and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal.

58. To the person who shall sow with hemp, in drills at least eighteen inches asunder, the next greatest quantity of land in any part of the united Empire, not less than twenty-five acres, statute measure, in the year 1810, and shall at the proper season cause the same to be plucked as abovementioned; the silver medal.

Certificates of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp and two quarts of the seed, on or before the second Tuesday in January, 1811.

59. Feeding of Cattle. For the best experiments on stall feeding of cattle (not less than five head) to be continued for the space of twelve months, in order to prove the earliest maturity and greatest propensity to fatten, of the most approved breeds of cattle in Great Britain, specifying the nature of the food given, together with the daily consumption of each beast, with its weekly increase in weight, and such other observations as may be deemed of consequence; the gold medal.

A full *account* of the methods employed, and of the expenses attending the same, and *certificates* of the sundry matters stated, to be produced on or before the second Tuesday in January, 1811.

PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYEING, AND MINERALOGY.

60. Preserving Seeds of Vegetables. For the best method of preserving the Seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the first Tuesday in December, 1810; the gold medal, or thirty guineas.

61. Preventing the Dry-Rot in Timber. To the person who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas.

The *accounts* of the cause, and method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the second Tuesday in Dec. 1810.

62. Preserving salted Provisions from becoming rancid or rusty. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from becoming rancid or rusty; the gold medal, or thirty guineas.

A full *description* of the method, with proper *certificates* that it has been found on repeated trials to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1811.

63. Refining Whale or Seal Oil. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light, though fully supplied with oil; the gold medal, or fifty guineas.

It is required that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and *certificates* that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil, in its unpurified state and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1811.

64. Manufacturing Tallow Candles. To the person who shall discover to the Society a method of hardening or otherwise preparing tallow, so that candles may be made of it which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or thirty guineas.

Certificates that 112lb. of such tallow have been made into candles, and 12lb. of the candles made thereof, to be produced to the Society on or before the second Tuesday in January, 1811.

65. Candles from Resin or other Substances. To the person who shall discover to the Society the best method of making candles of resin, or any other substance, fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas.

Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the first Tuesday in December, 1810.

66. Method of separating Sugar in a solid Form from Treacle. To the person who shall discover to the Society the best method of separating sugar from treacle, in a solid form, at such an expense as will render it advantageous to the public; the gold medal, or fifty guineas.

A quantity of the sugar so prepared, in a solid form, not less than thirty pounds weight, with an *account* of the process, and *certificates* that not less than one hundred weight has been so prepared, to be produced to the Society on or before the first Tuesday in February, 1811.

67. Increasing Steam. To the person who shall invent and discover to the Society a method, verified by actual experiments, of increasing the quantity or force of steam, in steam-engines with less fuel than has hitherto been employed, provided that in general the whole amount of the expenses in using steam-engines may be considerably lessened; the gold medal, or thirty guineas.

To be communicated to the Society on or before the first Tuesday in January, 1811.

68. Substitute for Tar. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind; and prepared from materials the produce of the united Kingdom and its Colonies; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1811.

69. Turpentine from the Scotch Fir or Pinus Sylvestris. For the greatest quantity of turpentine, not less than two hundred weight prepared in Great Britain from that species of fir called the Scotch fir, or Pinus sylvestris Linn; the gold medal.

Certificates of the turpentine being prepared from such trees of British growth, together, with fifty-six pounds of the turpentine, to be delivered to the Society on or before the second Tuesday in January, 1811,

70. For the next greatest quantity prepared, not less than one hundred weight, on similar conditions; the silver medal.

N. B. The Society being in possession of the method practiced for extracting turpentine from the trees whilst growing, and of samples so procured, information will be given upon the subject, on application for that purpose, at the Society's house.

71. Preparation of Tan. To the person who shall prepare, in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufacturers, the largest quantity, not less than one hundred weight of the principle called by the French *tannin*, which abounds in oak-bark and many other vegetable substances; the gold medal, or thirty guineas.

Certificates of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1811.

72. Indelible Ink. To the person who shall discover to the Society a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal, or fifteen guineas.

Certificates that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above mentioned, with a full detail of the process of making it, and two quarts of the ink to be delivered to the Society on or before the second Tuesday in January, 1811.

73. Preparation of a red Stain for Cotton Cloth. To the person who shall communicate to the Society the cheapest and most effectual method of printing or staining cotton cloths with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal, or thirty guineas.

Certificates that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length; one piece of the calico so printed, a quart of the colour in a liquid state, and a full *account* of the preparation and application, to be produced to the Society on or before the second Tuesday in January, 1811.

74. Preparation of a green Colour for printing cotton Cloth. To the person who shall communicate to the Society the best and cheapest method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld or alumine, and the solutions of indigo by earths or alkaline salts; the gold medal, or thirty guineas.

Certificates and conditions as for premium 73

75. Rendering Muslin less Combustible. To the person who shall discover to the Society a method of rendering muslin

less combustible, to be effected by a cheaper and more effectual mode than any hitherto known; the silver medal.

Specimens of the muslin so prepared, with a full account of the process employed for the purpose, to be produced to the Society on or before the first Tuesday in February, 1811.

N. B. It is expected that the means employed shall neither injure the quality of the muslin, stain it, nor damage any print or dye with which it may be coloured.

76. White Substance for the Basis of Paint. To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white-lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white-lead, the gold medal, or one hundred guineas.

A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1811.

77. Red Pigment. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use in oil or water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or thirty guineas.

One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1811.

N. B. It is not required that the colour should resist the action of fire, or chemical applications, but remain unaltered by the common exposure to strong light, damps, and noxious vapours.

78. Ultramarine. To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, and durability, to the best prepared from lapis lazuli, and which may be afforded at a cheap rate; the gold medal, or thirty guineas.

The conditions are the same as in the preceding premium for the red pigment.

79. Blue Pigment from Iron. To the person who shall invent, and discover to the Society, the best blue pigment from iron, superior to Antwerp or Prussian blue in colour and durability, fit for use in oil or water, which may be afforded at a cheap rate; the gold medal, or thirty guineas.

One pound weight of the colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1811.

N. B. It appears from the analysis of lapis lazuli by Klaproth, and the experiments of Guyton, (related in the Annales de Chemie) that ultramarine is a blue sulphurat of iron, and that a blue substance much resembling it is constantly found amongst the scoriæ of blast furnaces where iron is reduced, the Society by offering the above premium wish to call the attention of persons to these facts, and encourage them to make experiments, in the hope of producing a blue pigment which may be substituted for ultramarine.

80. Destructive Effects from Moths. To the person who shall discover to the Society a cheap, easy, and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by moths and other insects, in furs, woollens, and other articles, superior to any hitherto known or practised; the silver medal, or fifteen guineas.

The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1811.

81. Statuary Marble. To the person who shall discover, within Great Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal in all respects to those kinds now imported from Italy; the gold medal, or one hundred pounds.

A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and *certificates* of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1811.

N. B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate before the block required by the above premium is produced.

82. Preparation of Sulphuric Acid, from Sulphur without the Use of any Nitric Salt. To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid from sulphur without any nitric salt, of a specific gravity not inferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas.

Certificates that not less than the above quantity of such an acid has been prepared, together with a sample, to be produced to the Society on or before the first Tuesday in January, 1811.

83. Preparation of any Alkaline or Earthen Nitrate To the person who shall prepare, in Great Britain, the largest quantity, not less than one hundred weight, of any salt of nitric acid, with either earths or alkalis, by a method superior to, and as cheap as those hitherto practised; the gold medal, or one hundred guineas.

Certificates of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1811.

84. Fine Bar Iron. To the person, in Great Britain, who shall make the greatest quantity of bar-iron, not less than ten tons

with coak, from coak pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel; the gold medal, or fifty guineas.

Samples, not less than one hundred weight, with *certificates* that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1811.

85. Preserving Iron from Rust. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust; the gold medal, or fifty guineas.

A full description of the method of preparing the composition, with *certificates* that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1811.

86. Refining Block Tin. To the person who shall discover to the Society the best method of purifying or refining block-tin, so as to render it fit for the finest purposes to which grain-tin is now applied, and not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so refined or purified, with a full detail of the process, and a quantity, not less than one hundred weight, of the tin so refined, to be produced to the Society on or before the first Tuesday in January, 1811.

87. Glazing Earthen-Ware without Lead. To the person who shall discover to the Society the cheapest, safest, most durable, and most easily fusible composition, fit for the purpose of glazing the ordinary kinds of earthen-ware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas.

Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in February, 1811.

88. Cobalt, Zaffre, and Smalt. For the discovery of a mine of cobalt in Great Britain or Ireland, that will produce a sufficient quantity of the mineral, of good quality, to supply a manufacture of Zaffre or Smalt; the gold medal, or thirty guineas.

Certificates that at least one ton of the ore has been raised; and five pounds of Zaffre, and ten pounds of Smalt made therefrom, to be produced to the society on or before the last Tuesday in March, 1811.

N. B. It appears from the minutes of the Society, in 1755, that a discovery of Cobalt was made at or near Truro in Cornwall, but not a sufficient quantity of ore found to answer the desired purpose.

89. Refining Copper from the Ore. To the person who shall discover to the Society the best method of separating, purifying, and refining copper from the ore, so as to render it fit for the finest purposes to which fine copper is now applied, and by a process superior to any hitherto known or in use, and not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined to be produced to the Society on or before the first Tuesday in February, 1811.

90. Mineralogical Map of England and Wales. To the person who shall complete and publish an accurate mineralogical map of England and Wales, on a scale of not less than ten miles to an inch, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced; the gold medal, or fifty guineas.

Certificates of the accuracy of such map, together with the map, to be produced to the Society on or before the first Tuesday in February, 1811. The map to remain the property of the Society.

91. Mineralogical Map of Ireland. The same premium is offered for a mineralogical map of Ireland, on similar conditions.

92. Mineralogical Map of Scotland. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

93. Natural History. To the author who shall publish, in the year 1810, the natural history of any county in England, or Wales; the gold medal, or fifty guineas.

It is required that the several natural productions, animal, vegetable, and mineral, peculiar to the county, or found therein, be carefully and specifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1811.

PREMIUMS IN POLITE ARTS.

94. Honorary Premiums for Drawings by Nobility. For the best original drawing of any kind, by young gentlemen under the age of twenty-one, sons or grandsons of peers or peeresses in their own right, of Great Britain or Ireland; the honorary medal of the Society in gold.

95. The silver medal for the best copy.

96—97. The same premiums will be given, on the like conditions, to young ladies, daughters or grand-daughters of peers or peeresses in their own right, of Great Britain or Ireland.

98. Honorary Premiums for Drawings by Gentlemen. For the best original drawing of any kind, by young gentlemen under the age of twenty-one; the gold medal.

99. For the best copy, the silver medal.

100—101. The same premiums will be given for drawings by young ladies.

N.B. As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependant on the arts of design, or the sons or daughters of such persons, will not be admitted candidates in the above classes, including 94 to 101.

102. Drawings of Outlines. For the best outline, after the plaster cast, of any antique statue, by persons of either sex under the age of twenty-one, the figure not less than eighteen inches; the silver medal.

103. Drawings by Engravers' Pupils. For the best finished drawing of the fighting Gladiator, from a cast the size of the original marble, the size of the drawing not less than eighteen inches, by persons under twenty-one years of age; the silver medal.

104. Perspective Drawings of Machines. For the best perspective drawings of machines, by persons under twenty-one years of age; the silver medal.

105. Drawings of Landscapes. For the best drawing, in water-colours, of a landscape after nature, not less than eighteen inches by twelve, by persons of either sex, under twenty-one years of age; the silver medal.

106. Premiums for Drawings in General. For the best original drawing of any kind, by persons of either sex, under the age of twenty-one; the gold medal.

107. For the best copy, the silver medal.

108. Historical Drawings. For the best historical drawing, being an original composition of three or more human figures, the height of the principal figure not less than eight inches, by persons of either sex under twenty-one years of age; the gold medal.

109. For the next in merit; the silver medal.

110. Architectural Designs. For the best original design of a theatre to accommodate with seats three thousand spectators, to consist of plan, elevation, and section; the gold medallion. The drawing to remain the property of the Society.

111. For the next in merit; the silver medallion, on similar conditions.

The following inscription to be engraved on these medallions: *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, of Hampstead, esq.*

112. Paintings in Oil. For the best painting in oil, of a landscape after nature, the size thirty-six by twenty-eight inches; by persons of either sex, under twenty-five years of age; the gold medal.

113. For the next in merit, the silver medal. Each candidate must mention from whence the view was taken.

114. Etching of an Historical Picture. For the best finished etching of an historical picture; the gold medal.

115. Etching of a Landscape. For the best finished etching of a landscape, from a picture; the silver medal.

116. Engraving of Portraits. To the person who shall complete the best portrait engraved in the line manner; the gold medal.

It is required that two impressions of the engraving be produced, and to remain the property of the Society.

117. For the next in merit; the silver medal, on similar conditions.

118. Line Engravings of Historical Subjects. For the best historical engraving of any size; the gold medal.

119. For the next in merit; the silver medal.

120. Line Engravings of Landscapes. For the best line engraving of a landscape; the gold medal.

121. For the next in merit; the silver medal.

N. B. It is not necessary, in the classes of line engravings, for the artist's name to be concealed. The first aquafortis proof, is required to be sent in with two finished impressions. The aquafortis proof and the two impressions, to remain the property of the Society.

122. Engraving on Wood Blocks. For the best engraving on wood blocks of an historical subject; the size of the principal figure not less than six inches in height, and the block to be at least twelve inches by nine; the gold medal.

Two or more impressions, with the block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

123. For the next in merit; the silver medal, on similar conditions.

124. Medal Die Engraving. For the best die engraving of one or more heads after the engraver's own model; the gold medal.

125. For the next in merit; the silver medal.

126. For the best die engraving of one figure or a group consisting of not more than three figures, after the engraver's own model; the gold medal.

127. For the next in merit; the silver medal.

The dies, and two impressions or casts, and the model, in each claim for medal die sinking to be produced to the Society. The impressions or casts, but not the model or die, to remain the property of the Society.

128. Bronzes. For the best drapery figure or group cast in bronze; if a single figure, not less than twelve inches high; and if a group, not less than nine inches; and which will require the least additional labour to repair; the gold medal, or the silver medal and twenty guineas.

The cast to be exhibited to the Society before it is begun to be repaired, with the original figure or group, together with a full explanation of the whole process.

129. Fixing Chalk Drawings. To the person who discovers to the Society, an effectual method of fixing black and white chalk drawings without staining, or in any way injuring the drawing; the silver medal, or twenty guineas.

130. Black Lead Pencils. The silver medal or twenty guineas is offered to the person who shall discover an effectual method of freeing black-lead from impurity, and improving its quality, for the purposes of the arts.

N. B. The object of this premium is to obtain hard or soft pencils, uniformly of a good quality.

CONDITIONS.

FOR THE POLITE ARTS.

All the claims under this class are to be produced to the Society on or before the last Tuesday in February, 1811, and no other articles in the class of Polite Arts to be admitted into the Society with a view to bounties after the last Tuesday in March.

No person who has gained the first premium in any class shall be admitted a candidate in a class of inferior age; and no candidate shall receive more than one premium in one year.

No person shall be admitted a candidate in any class, who has already obtained the first premium in that class

No more than one performance in any class shall be received from the same candidate.

All performances (to which premiums or bounties are adjudged) shall remain with the Society until the first Wednesday in June, 1811, when they will be re-delivered, unless mentioned in the premiums to the contrary.

No performance shall be admitted, that has obtained a premium, reward, or gratification, from any other society, or academy, or been offered for that purpose.

All performances that obtain premiums in the Polite Arts must have been begun after the publication of such premiums, except line engravings.

It is required, that the matters for which premiums are offered, be delivered in without names, or any intimation to whom they belong; that each particular thing be marked in what manner each claimant thinks fit, such claimant sending with it a paper sealed up, having on the outside a corresponding mark, and on the inside the claimant's name, residence, and age; which paper is not to be opened unless the candidate be successful, or by a special vote of the Society.

To encourage real merit; and prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, to be made under the inspection of the Committee of Polite Arts, in every instance where such proof may appear necessary.

All candidates in the Polite Arts are required to signify, on their drawings, whether the performances are originals or copies; and to mark thereon the class for which each is intended, and if possible to send the original from whence the copies were taken.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

131. Employment of Females. To the person who shall instruct and employ the greatest number of Females, not fewer than twenty in the making of men's cloaths, particularly of woollen cloth, and not being for the use of the army or navy; the gold medal, or fifty guineas.

Certificates that the number of women above mentioned, have been constantly so employed for at least three months, to be produced to the Society, on or before the last Tuesday in March, 1811.

132. For the next greatest number of women so employed, not fewer than ten; the silver medal, or fifteen guineas, on similar conditions.

133. Cloth from Hop-Stalks, &c. To the person who shall produce to the Society the greatest quantity, not less than 30 yards of cloth, at least 27 inches wide, made in Great Britain or Ireland, of hop-stalks or bines, or other raw vegetable substances, the produce of Great Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop-stalks, &c.; the gold medal, or thirty guineas.

One pound of the thread of which the cloth is made, and thirty yards of the cloth, together with proper *certificates* that the whole is manufactured from hop-stalks or bines, &c. to be produced to the Society on or before the first Tuesday in December, 1810.

N. B. The Society is already in the possession of cloth made in England from hop-stalks or bines, which may be inspected by application to the Housekeeper.

134. Sheep's Wool. To the Person who shall prove to the Society that he has sold the largest quantity of Merino wool, or such wool as will answer the same purposes, being the produce of his own flock, for the purpose of being manufactured into superfine cloth, the quantity of wool, not less than five hun-

dred weight, in the year 1810; the gold medal.

Certificates, along with samples of the wool and of cloth manufactured from it, to be produced to the Society on or before the last Tuesday in March, 1811.

135. For the next greatest quantity, not less than two hundred and fifty pounds; the silver medal, on similar conditions.

136. Hog's Bristles. To the person who shall prepare the greatest quantity of bristles, from swine bred in the united kingdoms, equal in quality to those imported from Russia or Prussia, and at as cheap a rate; the silver medal, or fifteen guineas.

Certificates, that not less than one hundred weight have been so prepared, and a sample of not less than fourteen pounds of such bristles, to be produced to the Society on or before the last Tuesday in February, 1811.

137. Wicks for Candles or Lamps. To the person who shall discover to the Society a method of manufacturing hop-stalks or bines, or any other cheap material, the growth of Great Britain, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; the silver medal, or twenty guineas.

Samples, not less than five pounds weight, of the wick so prepared, to be produced to the Society on or before the last Tuesday in December, 1810, with *certificates* that the whole quantity is equal in quality to the sample.

138. Experiments to ascertain the proper Thickness of Wicks for Candles. To the person who shall make known to the Society the most satisfactory result of a series of experiments, actually made by him to determine the best thickness of cotton wicks for candles, so as to obviate the defects of those commonly used; the silver medal, or ten guineas.

Certificates, that not less than one hundred weight have been so made, and six pounds of the candles, to be produced to the Society on or before the last Tuesday in February, 1811.

N. B. The intention in offering this premium, is to ascertain the proper thickness or bulk of the wick in proportion to that of the tallow, and to remove the unpleasant consequences and waste arising from the sparkling, or guttering of the candles in common use.

139. Paper from raw Vegetable Substances. To the person who shall, between the first of January, 1810, and the first of January, 1811, make the greatest quantity, and of the best quality, (not less than ten reams) of good and useful paper, from raw vegetable substances, the produce of Great Britain or Ireland, of which one hundred weight has not been used in manufacturing paper, previous to January, 1809, superior to any hitherto manufactured from such substances and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; the silver medal, or twenty guineas.

N. B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, viz. nettles, potatoe-haulm, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the Housekeeper.

Certificates of the making such paper, and one ream of the paper, to be produced on or before the second Tuesday in January, 1811.

140. Transparent Paper. To the person who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and of a substance and body equal to foolscap, that shall take and bear common writing-ink, with the same facility and correctness as writing-paper generally in use; the silver medal, or twenty guineas.

Certificates of the making such paper, an *account* of the process, and one ream of the paper, to be produced on or before the second Tuesday in January, 1811.

141. Chintz Patterns for Calico-Printers. For the best original pattern in a new taste, of light and dark-ground chintz for garment-work, or furniture, fit for the purposes of calico-printers, by persons of either sex; the silver medal. The pattern for which the premium is adjudged to remain the property of the Society.

142. Copper-plate Patterns for Calico-Printers. For the best pattern, in a new style, fit for the purposes of calico-printers for garment work, or furniture; the silver medal. The pattern for which the premium is adjudged to remain the property of the Society.

N. B. The patterns to be produced on or before the last Tuesday in February, 1811.

143. Manufacture of Sail Cloth. To the person who shall produce to the Society a whole piece of sail cloth, of his own manufacture, proper for the general use of the Royal Navy, and equal to the best Dutch; the gold medal.

Certificates of its being manufactured by the person sending it, and a particular detail of the several circumstances attending its manufacture through the different stages thereof, to be sent to the Society on or before the last Tuesday in March, 1811.

144. For the next best in merit on similar conditions, the silver medal.

145. Gloves equal to French Kid. To the person who shall make known to the Society, a process equal to that of the French, or a superior one, for preparing, dyeing, and finishing the skins of which their

gloves are made, verified by actual experiments, and the communication accompanied with at least a dozen pair of gloves made from skins so prepared in an equal or superior manner; the gold medal, or thirty guineas.

Certificates from competent persons fully approving of the result of such experiments, together with the gloves and communication to be produced to the Society on or before the last Tuesday in March 1811.

PREMIUMS IN MECHANICS.

146. Gunpowder-Mills. To the person who, in the year 1810, shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder-mills, in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas.

Certificates and *accounts* of the method having been put in practice in one or more gunpowder-mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1811.

N.B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making, which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration, and such bounty or reward will be bestowed as they may appear to merit.

147. Transit Instrument. To the person who shall invent and produce to the Society a cheap and portable transit-instrument which may easily be converted into a zenith-sector, capable of being accurately and expeditiously adjusted for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit-instrument now in use; the gold medal, or forty guineas.

To be produced on or before the last Tuesday in January, 1811.

148. Taking Whales by the Gun-Harpoon. To the person who, in the year 1810, shall strike the greatest number of whales, not fewer than three, with the gun-harpoon; ten guineas.

Certificates of the striking such whales, and that they were actually taken in the year 1810, signed by the master, or by the mate, when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1810.

This premium is extended one year further, on similar conditions.

149. Family-Mill. To the person who shall invent and produce to the Society the best-constructed mill for grinding corn for the use of private families, or parish-poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal, or thirty guineas.

The mill, and *certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in February, 1811. Cheapness and simplicity will be considered as essential parts of its merit: and the mill or a model, to remain with the Society.

150. Machine for raising Coals, Ore, &c. &c. To the person who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at a less expense than those already known, or in use; the gold medal, or fifty guineas.

A model of the machine, made on a scale of not less than one inch to a foot, with a *certificate* that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in February, 1811.

151. Improved Walking-Wheel, or Crane. To the person who shall invent an improved walking-wheel or crane, on which the weight and power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered; the gold medal, or thirty guineas.

The model, on a scale of not less than one inch to a foot, with a proper *certificate* that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in February, 1811.

152. Machine for raising Water. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use for raising water out of wells, &c. from a depth of not less than fifty feet; the gold medal, or thirty guineas.

Certificates of the performance of the machine, and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1811.

153. Elm Pipes. To the person who shall invent and discover to the Society a substitute for the elm pipes now in common use for the conveyance of water, which shall be cheaper, equally effectual, and more durable than any heretofore employed; the gold medal, or fifty guineas.

It is required that one of the pipes so employed, an accurate *account* of the method used, and every expense attending it, together with satisfactory accounts of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1811.

154. Laying Wooden Pipes. To the

person who shall invent and discover to the Society a superior method of laying or connecting the wooden pipes now in use for conveying water, so as to lessen the injury they receive thereby; the silver medal, or twenty guineas.

It is required that a model, an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1811.

155. Extinguishing Fires. To the person who shall produce to the Society the best and most effectual method of procuring an immediate supply of water in case of fire, or for the means best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use; the gold medal, or thirty guineas.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in January, 1811.

156. Boring and Blasting Rocks. To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, of boring or blasting rocks in mines, shafts, wells, &c.; the gold medal, or thirty guineas.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in January, 1811.

157. Heating Rooms for the Purpose of Manufacturers. To the person who shall invent and discover to the Society a method of heating rooms, superior to any hitherto known or in use, and at a moderate expense, for the purpose of painters, japanners, and other manufacturers, so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented; the gold medal, or forty guineas.

A model or complete drawing and description of the method, with *certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1811.

158. Improved Ventilation. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used; the gold medal, or fifty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates*, to be delivered to the Society on or before the last Tuesday in February, 1811.

159. Preventing Accidents from Horses falling with two-wheeled Carriages. To the person who shall invent and produce to the Society a method, superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities; the silver medal, or fifteen guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1811.

160. Improving Turnpike and other Roads. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat, or any other mode, so as to form an even, hard, and durable carriage-road; the gold medal, or thirty guineas.

It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1811.

161. Raising the Bodies of Persons who have sunk under Water. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas.

The drag or machine, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in March, 1811.

162. For preventing prejudicial Effects to the Persons employed in Pointing Needles. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, by grinding them dry, during which the particles of grindstone, dust, and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal, or thirty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, together with proper *certificates* of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1811.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

163. Taking Porpoises. To the people in any boat or vessel, who, in the year 1810, shall take the greatest number of porpoises on the coast of Great Britain or Ireland, by gun, harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty pounds.

Certificates of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January, 1811.

164. Oil from Porpoises. To the person who shall manufacture the greatest quantity of oil from porpoises taken on the coast of Great Britain or Ireland, in the year 1809, not less than twenty tons; the gold medal, or thirty pounds.

Certificates of the oil having been made from porpoises actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1811.

165. Curing Herrings. To the person or persons who shall, before January, 1811, cure the greatest quantity of white herrings, not less than thirty barrels, equal in all respects to the best Dutch herrings, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

165. For the next greatest quantity, not less than fifteen barrels; the silver medal, or twenty guineas.

A sixteen gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1811, with *certificates*, that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed.

N. B. The Society have extended the premiums. No. 163 *to* 165, *one year further, on similar conditions.*

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH COLONIES.

166. Nutmegs. For the greatest quantity of merchantable nutmegs, not less than ten pounds weight, being the growth of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, and equal to those imported from the islands of the East Indies; the gold medal, or fifty guineas.

Satisfactory *certificates*, from the governor, or commander in chief, of the place of growth, with an *account* of the number of trees, their age, nearly the quantity of fruit, on each tree, and the manner of culture, to be produced on or before the first Tuesday in January, 1811.

167. Kali for Barilla. To the person who shall have cultivated, in the Bahama Islands, or any other part of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, in the year 1809, the greatest quantity of land, not less than two acres, with Spanish kali fit for the purpose of making barilla; the gold medal, or thirty guineas.

168. For the next greatest quantity, not less than one acre; the silver medal, or fifteen guineas.

Certificates, signed by the governor or commander in chief for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such *certificates*, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in January, 1811.

169. Destroying the Insect commonly called the Borer. To the person who shall discover to the Society an effectual method of destroying the insect commonly called the Borer, which has of late years been so destructive to the sugar-canes in the West-India islands, the British settlements on the coast of Africa, and the several islands adjacent thereto; the gold medal, or fifty guineas.

The discovery to be ascertained by satisfactory *certificates*, under the hand and seal of the governor or commander in chief for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such *certificates* to be delivered to the Society on or before the first Tuesday in January, 1811.

170. Cultivation of Hemp in Upper Canada. To the person who shall sow with hemp, the greatest quantity of land in the province of Upper Canada, not less than six arpents, (each four-fifths of a statute acre) in the year 1809, and shall at the proper season cause to be plucked the summer hemp, or male hemp bearing no seed, and continue the winter hemp, or female hemp bearing seed, on the ground until the seed is ripe; the gold medal, or one hundred dollars.

171. To the person who shall sow with hemp the next greatest quantity of land in the same province of Upper Canada, not less than five arpents in the year 1809, in the manner above mentioned; the silver medal, or eighty dollars.

172. For the next greatest quantity of land, in the same province, and in a similar manner, not less than four arpents; sixty dollars.

173. For the next greatest quantity of

land in the same province, and in a similar manner, not less than three arpents; forty dollars.

174. For the next greatest quantity of land, in the same province, and in the same manner, not less than one arpent; twenty dollars.

Certificates of the number of arpents, the method of culture, of the plucking of the hemp, with a general *account* whether sown broad-cast or in drills, the expense, soil, cultivation, and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in April, 1811.

175 to 179. In Lower Canada. Premiums exactly similar in all respects to those held out for the province of Upper Canada, are also offered to the province of Lower Canada.

180 to 184. In Nova Scotia and New Brunswic. Similar premiums in all respects are also offered to the provinces of Nova Scotia, and new Brunswic.

185. Importation of Hemp from Canada, Nova Scotia, and New Brunswic. To the master of that vessel which shall bring to this country the greatest quantity of marketable hemp, not less than one hundred tons, in the year 1810, the produce of Upper Canada, or of one of the above-mentioned provinces; the gold medal.

186. To the master of that vessel which shall bring the next quantity, not less than fifty tons; the silver medal.

Certificates satisfactory to the Society, to be produced by the master of the vessel on or before the first Tuesday in February, 1811, to testify that such hemp was grown and prepared in Canada, Nova Scotia, or New Brunswic.

187. Substitute for Hemp. To the person who, in the year 1810, shall discover and produce to the Society, a substitute for hemp, equally cheap, durable, and applicable to all the purposes for which hemp is now used; the gold medal, or fifty guineas.

A quantity of the substitute, not less than one hundred weight, together with proper *certificates* from the governor or commander in chief, if raised in any of the British colonies, or from the Secretary of the Board of Trade, if raised in the East Indies, to prove that the same has been used with success, to be produced to the Society on or before the last Tuesday in February, 1811.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH SETTLEMENTS IN THE EAST INDIES.

188. Bhaugulpore Cotton. To the person who shall import into the port of London, in the year 1810, the greatest quantity, not less than one ton, of the Bhaugulpore cotton, from which cloths are made in imitation of nankeen, without dyeing; the gold medal.

A quantity of the cotton not less than five pounds weight, in the pod, and five pounds carded, to be produced to the Society, with proper *certificates*, signed by the Secretary to the Board of Trade of Bengal or Bombay, on or before the last Tuesday in February, 1811.

189. Annatto. To the person who, in the year 1810, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, not less than five hundred weight; the gold medal.

A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1811.

190. True Cochineal. To the person who, in the year 1810, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of true cochineal, not less than three hundred weight; the gold medal.

A quantity of the cochineal, not less than three pounds weight, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective setttlement, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1811.

N. B. The premiums from No. 166 *to* 190, *inclusive, are all extended two years further on similar conditions. Certificates to be produced at the same time of the years ensuing.*

GENERAL CONDITIONS.

As the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that if the *means*, by which the respective objects are effected, do require an expense or trouble too great for *general purposes*, the Society will not consider itself as bound to give the offered *reward;* but, though it thus

reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

All candidates are to take notice, that no claim for a premium will be attended to, unless the conditions of the advertisement are fully complied with.

All models of machines, which obtain premiums or bounties, shall be the property of the Society; and, where a premium or bounty is given for any machine, a perfect model and description thereof shall be given to the Society.

All the premiums of this Society are designed for Great Britain and Ireland, unless expressly mentioned to the contrary.

The claims shall be determined as soon as possible after the delivery of the specimens.

It is expected that all articles for claims or bounties be sent to the Society, carriage paid.

No person shall receive any premium, bounty, or encouragement, from the Society, for any matter for which he has obtained, or purposes to obtain, a patent, or for which he has obtained, or expects any premium or reward from any other Society.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their claims; and where certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the respective advertisements, and be signed by persons who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidate, not a member, shall be present at any meetings of the Society or Committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the Committee.

The Society, anxious to promote the Arts of their country, have adopted the resolution of forming a Collection of Prints, to be open for public inspection; and, having arranged those already in their possession, invite engravers to send etched or finished proofs of their plates: and hope that amateurs, collectors, and publishers of works of art, will also contribute to the undertaking.

Prints of machines, or maps, will also come within the above arrangement.

The Society farther invite the communications of scientific and practical men, upon all subjects connected with the views of the Society, although their experiments may have been conducted upon a smaller scale than the terms required by the premiums; as such communications may afford ground for more extensive application, and thus materially contribute to the advantage of the public.

The Library of the Society, which has already become very valuable, may yet receive considerable additions and improvements from the presents of members, or other persons who may be inclined to place useful books or valuable manuscripts in a repository, at once permanent and conducive to the national benefit.

All communications are to be made by letter, addressed to CHARLES TAYLOR, M. D. the Secretary, *at the Society of Arts, &c. Adelphi, London.*

And where articles are sent by Sea for the Society, the Bills of Lading are to be addressed to the care of WILLIAM VAUGHAN, Esq. *Mincing-lane, London*, who has politely undertaken to receive them for the Society.

The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute Acres of five and a half yards to the rod or pole, when acres are mentioned in their list of premiums; and they request that all communications to them may be made agreeably thereto.

The Society desire that the Papers on different subjects sent to them may be full, clear, explicit, fit for publication, and rather in the form of Essays than of Letters; and that descriptive Drawings may be sent, with the Models and Machines laid before the Society.

*** To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

Item. I give and bequeath to A. B. and C. D. the sum of upon condition and to the intent that they, or one of them, do pay the same to the Collector, for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards the carrying on the laudable designs of the Society.

N. B. The Society considering that it would be beneficial to the Commerce of the United

Kingdom to bring the British Marbles into more general use, and that the most effectual method of accomplishing their object would be, for the present, to make them more generally known in the capital, have come to the following resolutions:—

Resolved,—That specimens of British Marbles be exposed in the Society's Rooms, at the Adelphi, for the inspection of the public, under the following regulations:

1st. That all the specimens be exact to a given size, *viz.* eight inches high, six inches broad, one inch thick, and polished on one face.

2. That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name of the parish where situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

Resolved,—That as the exertions of the Society can be beneficial to the public, only inasmuch as their views are seconded by the public, the Society request, that all persons proprietors of marble quarries, will favour them with a specimen of the marble, worked to the exact size above mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public. By such arrangements, it is expected that the interest of the proprietors of the quarries will be promoted, and the use of British marble much extended. A variety are already exhibited in the Society's Great Room.

The Society take this opportunity of returning their thanks to the several Societies and Individuals, who have favoured them with presents for their Repository and Library.

Premiums and Rewards bestowed in May, 1810, *by the Society of Arts, Manufactures, and Commerce, Adelphi.*

ON Tuesday the 29th of May, 1810, the Rewards of the Society were, as usual, distributed by his Grace the Duke of Norfolk, arranged under the following classes; and on Wednesday, the 6th of June, the Society held the last Meeting of that Session, and adjourned to the fourth Wednesday in October next.

IN AGRICULTURE.

To T. Johnes, Esq. M. P. Hafod, Cardiganshire, for planting 300,000 larch trees, 30,000 beech, and 10,000 spruce firs, class 10; the gold medal.

To J. C. Curwen, Esq. M. P. Workington Hall, Cumberland, for experiments on stall feeding of cattle, class 54; the gold medal.

To J. Stockdale, Esq. of Cark, Lancashire, and R. Towers, Esq. of Dudden Grove, in Cumberland, for gaining 564 acres of land from the Sea at Windermeer in Lancashire, class 34; the gold medal.

To I. Berney Petre, Esq. Westwick House, Norfolk, for extensive plantations of pinaster fir trees, the silver medal.

To E. Smith, Esq. of Brentwood, Essex, for preparing from the fibres of the common nettle, thread, and articles resembling flax, hemp, tow, and cotton, the silver medal.

To Mr. T. Balls, Saxlingham, near Holt, Norfolk, for a screw adjusting plough, the silver medal.

To Mr. W. Jeffery, Cotton End, Northampton, for a pair of expanding harrows, applicable both for clearing foul land, and harrowing in seeds, the silver medal.

To Mr. J. Hutton, Jun. Ridgway, near Sheffield, for an improved reaping hook, the silver medal.

To Mr. J. Baker, West Coker, near Yeovil, Somersetshire, for an improved implement for destroying docks and thistles, the silver medal.

IN CHEMISTRY.

To Mr. I. Jopling, Gateshead, Durham, for searching out, and working quarries of British marble, the gold medal.

To H. B. Way, Esq. of Bridport Harbour, Dorsetshire, for his method of extracting turpentine from firs of English growth, the silver medal.

To Mr. B. Cooke, of Birmingham, for his method of producing heat, light, and various useful articles from pit coal, the silver medal.

IN POLITE ARTS.

To Miss J. Steele, Westminster, for an original landscape of the houses called the Five Chimnies, in Tothill Fields, class 101; the silver medal.

To Miss R. Drummond, Church Street, Soho, for an original portrait in crayons, the silver medal.

To Miss J. Watts, Prince's Place, Kennington, for painting and gilding on China, the lesser silver pallet.

To Miss E. Phillips, Wandsworth Road,

for an oil painting, a view of New Shoreham, the greater silver pallet.

To H. Parke, Esq. Dean Street, Soho, for an oil painting of a Dutch smack going off in a gale, the silver medal.

To Mr. H. D. Thielcke, Queen's House, for an oil painting of the holy family, the greater silver pallet.

To Mr. J. Roberts, Broad Street, Golden Square, for an outline of the Laacoon and Sons, class 98 ; the silver medal.

To Mr. E. Finden, John Street, Fitzroy Square, for an outline of the Laacoon, the smaller silver pallet.

To Mr. I. Brewster, Winchester Place, Pentonville, for a pen and ink drawing, the greater silver pallet.

To Mr. R. A. Freebain, Kepple Row, Fitzroy Square, for a drawing of St. Paul preaching, the smaller silver pallet.

To Mr. C. Eastlake, Broad Street, Carnaby Market, for a drawing of Cupid and Psyche, class 95 ; the silver medal.

To Mr. D. Dighton, Charing Cross, for an original drawing of the defeat of King Porus by Alexander the Great, on the Banks of the Hydaspes, the greater silver pallet.

To Master W. C. Ross, No. 61, Stanhope-street, Clare-market, for an original drawing of Caractacus, the British King, before Claudius Cæsar at Rome, the silver medal and twenty guineas.

To Master J. Farey, Upper Crown-street, Westminster, for an original perspective drawing of London-bridge water works, the greater silver pallet.

To Master L. Landseer, Queen Ann-street East, for an etching of sheep and goats, the smaller silver pallet.

To Master I. C. Bromley, Brook-green, Hammersmith, for an original etching of a stag hunt, the silver medal.

To Mr. J. Hassel, Clement's-inn, for an ingenious improvement in the aqua-tinta process, by which pen, pencil, and chalk drawings can be easily imitated, the silver medal and thirty guineas.

To Mr. A. Wilson, Duke-street, Lincoln's inn-fields, for skill and exertions in Steryotype printing, the gold medal.

To Mr. T. Allason, Bentinck-street, Manchester-square, for an original design of an academy of arts, class 117 ; the gold medallion, being the premium given by this Society, in conformity to the will of the late John Stock, esq. of Hampstead.

To Mr. G. Philips, Wandsworth-road, for an original design of an academy of arts, the silver medallion pursuant to the said will.

To Mr. R. Cathery, No. 14, Meads-row, Westminster-road, near the Asylum, Lambeth, for a preparation of ox-gall for painters' and for other uses, ten guineas.

To Master S. Sutton, Upper Norton-street, Marylebone, for a plaster figure of the Gladiator, the smaller silver pallet.

To Mr. T. Wyon, Jun. John-street, Blackfriars, for a medal die engraving of a beautiful head of Isis, the patroness of the arts, the gold medal.

MANUFACTURES.

To Mr. J. Locket, Donnington, near Newbury, for weaving damask napkins, equal to foreign, the silver medal.

To Mr. I. Sholl, Elder-street, Norton-falgate, for an improvement in machinery for weaving figured silks, fifteen guineas.

IN MECHANICS.

To H. P. Lee, esq. of Maidenhead-thicket, for an improved thrashing-machine, class 43 ; the gold medal.

To Mr. I. Allan, Blewitt's-buildings, Fetter lane, for his improvements in a mathematical dividing engine, the gold medal.

To Mr. Bryan Donkin, Fort-place, Bermondsey, for a tachometer, or, an instrument to ascertain the velocities of machinery, the gold medal.

To the Rev. J. Bremner, Walls, Orkney Islands, for a method of making any ship's boat a life-boat to preserve the lives of the crew in eminent danger, the silver medal and twenty guineas.

To Mr. S. Hemman, Chatham-dock-yard, for an improved mooring-block for ships, the silver medal.

To Mr. I. Davis, No. 7, John-street, Spital-fields, for a method of assisting persons to escape from houses on fire, fifty guineas.

To Mr. G. Marshall, No. 15, Cecil-street, St. Martin's-lane, for constructing sash windows, so as to be cleaned and repaired within the house, fifteen guineas.

To Mr. B. Smith, No. 11, Turnham-place, Curtain-road, Shoreditch, for a method of raising a loaded cart when the horse in the shafts has fallen with it, fifteen guineas.

To Mr. I Taylor, Holwell, Tavistock, for a method of ventilating mines, or hospitals, by extracting the foul air, the silver medal.

To Mr. W. Moult, No. 37, Bedford-square, for his method of using the filtering stone, for purifying Water, the silver medal.

To Mr. A. Reid, Green's end, Woolwich, for a compensation pendulum, fifteen guineas.

To Mr. G. Spark, Elgin, for a method of knowing the hour in the dark by a common watch, the silver medal.

To Mr. E. Baker, Whitechapel-road, for a method of rendering pistols more safe to the bearer, and more effectual in use, the silver medal.

To Mr. C. Williams, Cane place, Gravel-lane, for a method of boring the conical part of brass cocks, twenty guineas.

To Mr. L. Aubrey, Fort-place, Bermondsey, for instruments for equalizing the width and thickness of leather straps, thirty guineas.

To Mr. I. D. Ross, No. 55, Princes-street, for a machine for separating iron filings from their mixture with other metals, five guineas.

To Mr. I. Whitford, St. Bartholomew's-hospital, for an elastic steel truss for ruptures, the silver medal.

To Mr. G. Prisley, Church-street, Soho, for constructing spring crutches for invalids, the silver medal.

To Mr. I. Morrison, No. 145, Holborn, near Brook-street, for inventing implements, by which persons who have had the misfortune to lose their hands may usefully assist themselves, the silver medal and forty guineas.

The number of Members elected since October 1809, *is One Hundred and Thirty-four.*

The List of Premiums offered may be had, *gratis*, at the Society's House in the Adelphi:

By Order of the Society,

June, 1810. CHARLES TAYLOR, M.D. Secretary.

N. B. Where errors have arisen in the address of any Member of the Society, information is desired to be given to Mr. R. Elwin, the Collector, at the Society's house in the Adelphi, who receives the Subscriptions from the Members and furnishes Receipts for the same.

Lately was published, Price 10*s.* 6*d.*

The TWENTY-SEVENTH VOLUME of the SOCIETY'S TRANSACTIONS, which may be had from the Housekeeper, at the Society's House in the Adelphi. Also complete Sets of their Transactions, or any single Volume.

Also, An ANALYTICAL INDEX of the FIRST TWENTY-FIVE VOLUMES of the TRANSACTIONS of the SOCIETY, to the Termination of their Session, June, 1807, price 5s.

A CATALOGUE of the BOOKS in the Society's Library may be had as above, price One Shilling.

PAPERS

IN

AGRICULTURE.

The GOLD MEDAL, *being the Premium offered in Class 43, for a* THRASHING MACHINE, *was this Session adjudged to* H. P. LEE, *Esq. of Maidenhead Thicket, from whom the following Communications were received. An Explanatory* ENGRAVING *is annexed, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

I BEG leave to state to the Society of Arts, &c. the following particulars, relative to my attempts to improve the Thrashing Machine for Corn, and of my success therein.

Being largely concerned in agriculture, and having 800 acres of arable land, I found that a Thrashing Machine or two became absolutely necessary for the continuance of my occupations. I accordingly erected one of the kind recom-

mended to me; but from the complication of its structure, its being frequently out of order, and from its bad performance of the work at all times, I resolved to try to have a Thrashing Machine made under my own directions, more simple in its construction, and more efficacious in its operations. With this view I have continued my experiments for nearly three years, at an expense of about three hundred pounds, and have, at last, brought my machine to a degree of perfection which is satisfactory. Many gentlemen and farmers who have seen it and its operations, give it a decided preference to any they have seen, for the simplicity of its construction, for the cleanness of its thrashing, and for the quantity of corn thrashed by it, in proportion to the power applied.

I have no doubt but that the result of my original thoughts and experiments on this subject, will be of great advantage in this highly useful agricultural implement, and I have sent a model of the machine for the Society's inspection.

I am, Sir,

Your very obedient Servant,

H. P. LEE.

Maidenhead Thicket, Dec. 27, 1809.

To C. Taylor, M. D. Sec.

Certificates from Mr. Edward Green, of Bowlney, in Oxfordshire, and Mr. Thomas Michlem, of Hurley, in Berkshire, stated, that they are largely concerned in the agricultural line; that they have seen a variety of Thrashing machines, but give the preference to those on Mr. Lee's principle, for the simplicity of their construction; that they highly approve of the manner in which they perform their work,

work, and that they consider them as calculated to thrash more corn, in proportion to the power applied, than any other they have seen.

CERTIFICATES from WILLIAM HUBBEARD, of Maidenhead Thicket; THOMAS WILLIAMS, of Feeres Farm, in White Waltham; JOSEPH LEE, of White Waltham, and RICHARD SILVER, of Maidenham Thicket, testified, that on the 27th February, 1810, Mr. Lee's Thrashing Machine did thrash in one hour and fifty-five minutes, eight quarters and three and a half bushels of barley; that the straw was thrashed clean and not broken, and the work was in all respects performed in a workmanlike manner.

A CERTIFICATE from JAMES WILLIS, foreman to Mr. Lee, stated, that on the 27th and 28th February, 1810, he did thrash thirty quarters of oats with Mr. Lee's machine, at Highway Farm, in the parish of Cookham, Berkshire.

SIR,

AFTER inspecting several Thrashing Machines by a variety of makers, I saw and examined your's, at Highway Farm, and was impressed with its superiority over every other that I had seen, both on account of its simplicity and effect. I applied to Wright, your builder, who has erected one for me upon your improved principle, which effectually thrashes wheat and barley clean, without injuring the straw, and very much to my satisfaction. I have not hitherto had an opportunity of ascertaining its powers with other grain, but am happy to assure you, that I consider your improvements to constitute a material step towards perfecting an

instrument of the first consequence to the agricultural interests of this kingdom, and highly deserving our warmest acknowledgments.

I have the honor to subscribe myself, Sir,

Your obliged humble Servant,

SAMUEL NICHOLLS, M. D.

Hinton House, Twyford, Berks,
March 1, 1810.

To H. P. Lee, Esq.

A Certificate from Mr. G. H. Crutchley, of Sunning Hill Park, Berks, dated March 3, 1810, stated, that he had seen Mr. Lee's Thrashing Machine at work; that it thrashed clean, and pleased him so well that he had ordered one on the same principle.

By subsequent letters received from Dr. Nicholls and Mr. G H. Crutchley, the above Certificates were confirmed by them, with additional testimonies in favor of Mr. Lee's machines.

Mr. Lee, in his attendance on the Committee appointed by the Society for the examination of the merits of his machine, stated, That his machine requires no rollers for entering the corn to be thrashed.

That it is about three feet diameter, and about two feet six inches in length.

That two horses are quite sufficient to work it; that from half-past seven to two o'clock they will, without fatigue, thrash two loads of wheat, each of forty bushels.

That he thinks the straw is not so much broke as with other machines.

That the vanes within the cylinder turn from one hundred

to

to one hundred and twenty times round for one round of the horses, in a space of twenty-two feet diameter.

That there are four vanes within the drum or cylinder, each vane one inch and a half thick, and inclosed to within about three inches of their exterior edges; that the drum or cylinder, within which the vanes turn, is close-fluted with wood of about an inch thick, and is in moveable parts, so as to admit of being placed nearer to, or further from, the vanes, as the corn to be thrashed may require.

That he has erected two of those machines on his estate, and has used them for three years.

A note sent to the Society by William Wright, of Henley-upon-Thames, Oxfordshire, the maker, states, that the price of a thrashing machine on this principle, including the horse-wheel, is forty-eight pounds, at his manufactory there.

Reference to the Engraving of Mr. Lee's Thrashing-Machine, Pl. 1. *Fig.* 1 *and* 2.

Fig. 1 and 2 are a side and end-view of the machine; A, in both figures, represents the framing of the machine; B is the shaft of a cog-wheel C, which is turned by cog-wheels, from the great horse-wheel, in the same manner as the ordinary thrashing mill; the cog-wheel C turns a small pinion D, to which it gives a rapid revolution; on the axis of the pinion, the beaters EE are fixed, and revolve with it, within a segment or drum, formed of iron plates, grooved or ribbed, parallel to the axis, as the figure represents, and connected together by wooden curbs FF, to which they are screwed. *a a* is the feeding board upon which the corn is placed to enter the machine. The end of this board is fixed very near to the four vanes, or beaters, *b b b b*; as these revolve

rapidly they strike the heads of the corn upwards, with such a jerk as to beat out all the corn from those ears which they meet fairly; but if any escape they are drawn in, together with the straw, and rubbed round by the beaters against the inside of the ribbed drum, or cylinder, F, so as to open the ears and let out the corn, though the ears come in any position whatever. At H is a grating, upon which the beaters deliver the corn, chaff, and straw altogether; the two former fall through upon the ground at X, and the latter slides down on the grate; the corn is afterwards to be dressed in a winnowing machine, which separates the light and heavy corn from the chaff The curbs F are fixed by screws, which can be adjusted so as to bring the cylinder nearer, or farther from, the beaters, to adapt the machine for thrashing different kinds of grain, for it is evident that large corn, as peas, beans, &c., must require more space to rub them in than the smaller grain, as wheat and barley. L, fig. 1, is one of the uprights of the frame which supports the bearing for the axis B of the cog-wheel; and M is an oblique brace, which strengthens the frame. N is the stage on which the man who feeds the machine stands.

The GOLD MEDAL *of the Society was this Session adjudged to* THOMAS JOHNES, *Esq. M. P. of Hafod, in Cardiganshire, for his Plantations of Larch and other Trees, and from whom the following Communications were received.*

DEAR SIR,

INCLOSED is a certificate from the Rev. Mr. Evans, which I only received this morning, and hope it will prove satisfactory

Mr. Lee's Thrashing Machine.

Fig. 1.

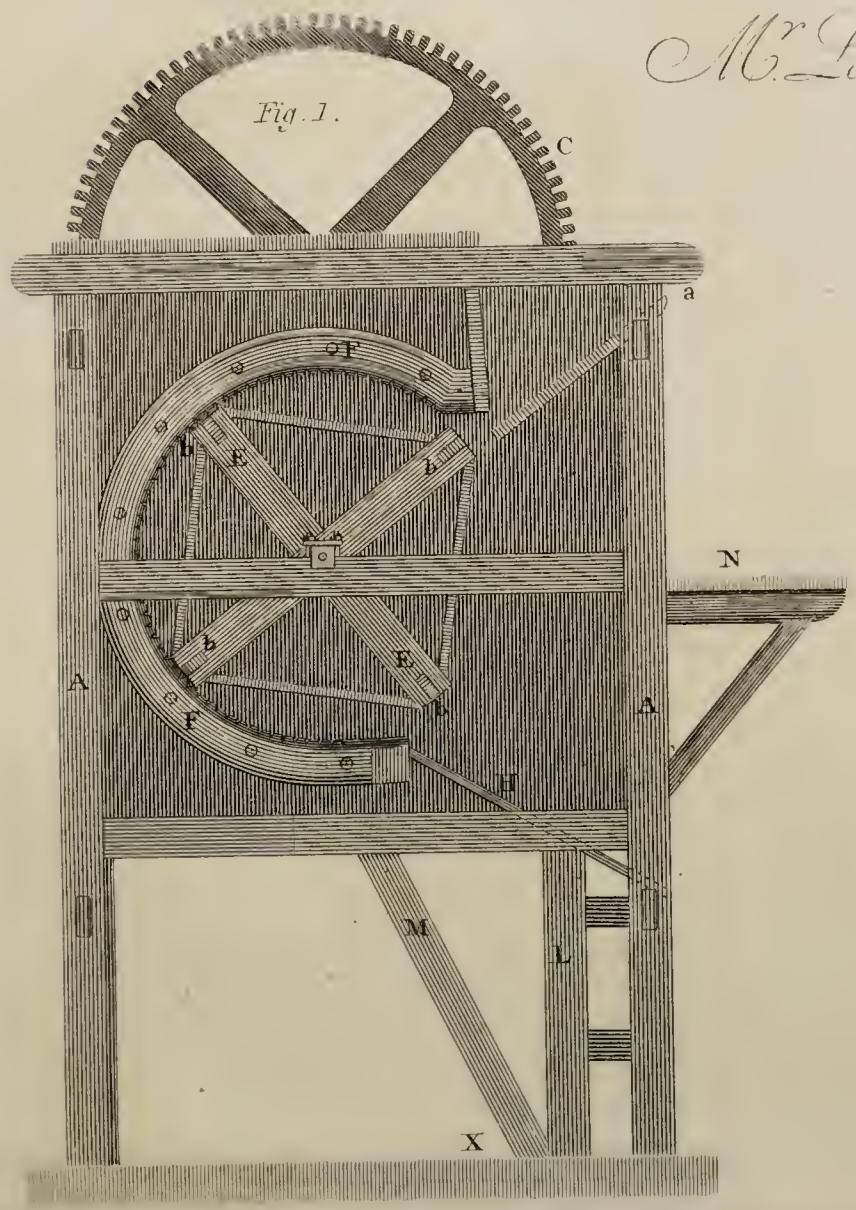
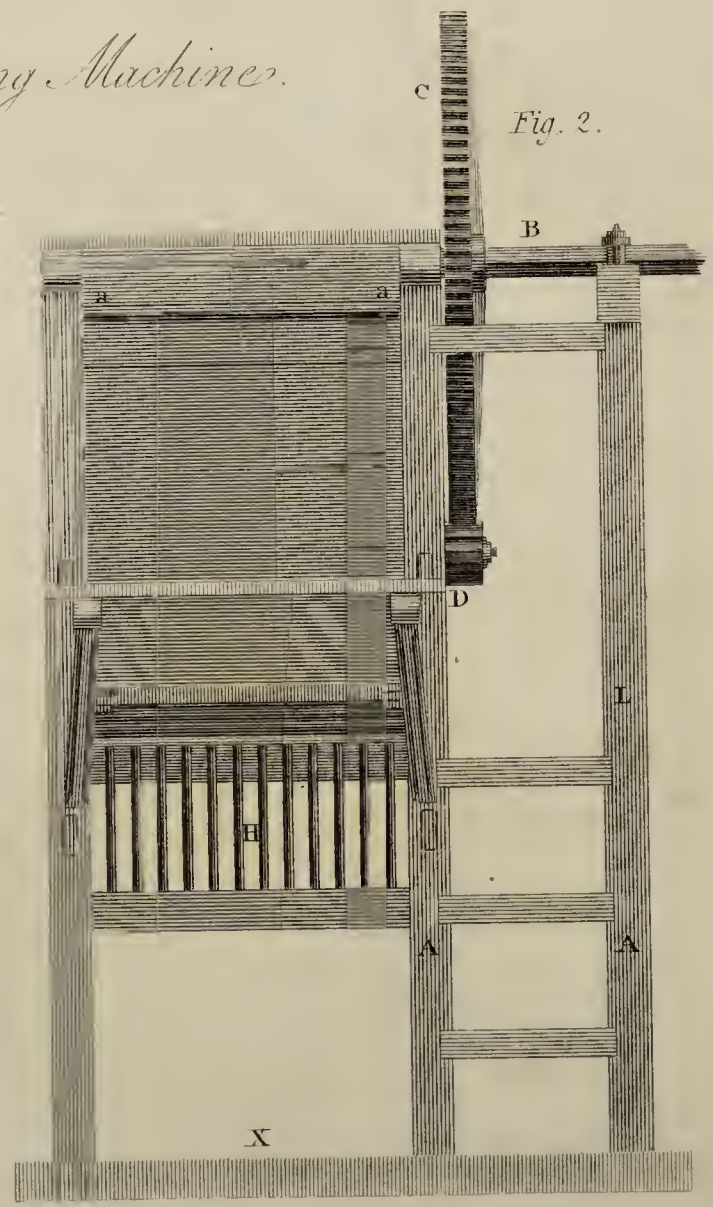


Fig. 2.



Engraved b

factory in establishing my claim upon the Society for the plantations therein specified.

I remain, Dear Sir,

Your's, very truly,

THOMAS JOHNES.

Castle Hill, Dec. 20, 1809.

To C. Taylor, M. D. Sec.

This is to certify, that Thomas Johnes, Esq., has planted three hundred thousand larch trees, thirty thousand beech, and ten thousand spruce-firs, on Hafod demesne, in the chapelry of Eglwys-Newydd, in the parish of Llanfihangel-y-Croydelyn, in the county of Cardigan, between the 24th of June, 1806, and the 24th of June, 1807, on such lands as are not calculated for the purpose of husbandry, because the grounds cannot be ploughed in consequence of their being so very uneven, the soil very shallow and stony, and the situation altogether steep and high, and having a northern aspect.

The above plantations are well fenced on the side next the public road, by a stone wall five feet high, and the same coped with sods of turf of a foot high thereon; and on the other side by a common mound or bank five feet high, with a dry hedge on the top of the same from a foot and a half to two feet high. The whole fence on both sides is constantly attended to and kept in good repair. The trees have not suffered any injury hitherto from sheep or any other cattle. They appear healthy and thrive as well as can be expected.

Witness our hands this 18th day of December, 1809.

Lewis Evans, Minister of Eglwys-Newydd, aforesaid.
John Greenshilds, Bailiff and Planter.

DEAR SIR,

INCLOSED I send, at your request, the original report made to me by my bailiff of the height and girth of some of my plantations; but it is not so accurate as I could wish, as all the memoranda I had made of planting had been destroyed by the fire here.

I am, my Dear Sir,

Your's always,

T. JOHNES.

Hafod, Nov. 1, 1810.

To C. TAYLOR, M. D. SEC.

Girths of larch trees in different plantations belonging to Thomas Johnes, Esq. of Hafod, in Cardiganshire, taken by John Greenshilds, at six feet from the ground, with the supposed dates of the time when planted.

	Girth.
Plantations by Bakehouse, planted in 1782 . . .	21 Inches.
———, Pwllpiran, 3 feet trees when transplanted, now 14 years old	16
———, ditto, Hill, 1802, 12 and 15 inches . .	12
——— above the Church, 1782, ...	21
———, Roundabout Field, 1785, ...	18
——— opposite the new farm, 1808, 4 feet high . .	3

A tree growing near the house, which was brought here from Herefordshire, in a pot, by Mr. Painter, in 1772 or 1773, is now 7 feet 4 inches girth. A tree fronting the Conservatory was transplanted at five feet high in 1780, is now 3 feet 1 inch girth.

The

The GOLD MEDAL *of the Society, being the Premium offered Class 54, for Experiments on Stall-feeding of Cattle, was this Session adjudged to* JOHN CHRISTIAN CURWEN, *Esq. M. P. of Workington-Hall, Cumberland, from whom the following Communications were received.*

DEAR SIR,

THE following experiments were made in feeding two-year-old heifers for the space of twelve months, from the 1st of October, 1808, to the last day of September, 1809, with a view of ascertaining the early maturity and propensity to fatten of the various breeds:—viz. two Herefords, two Short-horned, two Galloways, two Glamorgans, two Long-horned, and two of the Sussex breed. Devons could not be procured that could be warranted not to be in calf, and one of the Sussex was obliged to be discontinued in the experiment on that account.

The different specimens of the breeds were tolerably good; it is not to be expected that breeders will part with their most promising stock.

The whole were collected some time previous to the commencement of the experiment, in order that those which came from a distance might recover from the effects of driving. Except once a fortnight, to be weighed, they were never out. They continued, almost without exception, in perfect health during the whole time. From the difference which has occurred in feeding between the specimens of the same breed, without any superiority of the animal, it will be apparent that numerous experiments must

be

be made before any decisive judgment can be formed as to the superiority of one stock over another.

I am disposed to believe, that in order to obtain a satisfactory result, the experiment must commence with the dropping of the calf, as the most material difference will be made in the mode of feeding for the first few months.

The food was accurately weighed three times a week to each class. After some little time there was found to exist so little difference between the consumption of the animals of the same breed, that a separate account between them was discontinued. The same quantity of food is therefore supposed to be consumed by each.

Though the experiment fails in deciding the superiority of one stock over another, yet it will, I apprehend, afford some very desirable information as to the consumption of food and increase of weight. It will be found to furnish the most incontestible proof in favor of soiling or stall-feeding, and remove every doubt which may have been entertained of its being injurious to the health of cattle. The two Hereford and Sussex were purchased for the purpose of breeding from, and have since been turned out to reduce their condition, and are at this date perfectly well.

I think it will appear evident that expensive food cannot be given to cattle with any prospect of a return of profit.

The mode which I have taken of calculating the profit upon the respective breeds, may be subject to objection, as some animals gain weight in carcase, others in inside fat; it is however the only way which I could devise.

The continued moisture and want of sun during the months of August and September, operated much against the cattle; most of them will be found to have lost weight for one fortnight; and I doubt not they gained less than they would have done in a more favorable year. The clover,

from

from too great moisture, appears to have been deprived of much of its nutritious quality.

I have offered no estimate as to the worth of the manure, the quantity depending so much upon the value of straw. When it sells from two-pence to three-pence per stone, as little is used as can be avoided.

I have no hesitation in giving it as my opinion, that the manure will do greatly more than pay for all expenses of attendance, procuring food, &c. The urine may be turned to the most profitable account by preserving it and pumping it upon earth. Prodigious quantities of the most valuable manure may be made by this method. In a system of two shifts, which I am pursuing, I place my reliance on this resource for two or three thousand tons of manure annually.

The health and progress of the cattle in fattening are greatly dependent upon their being kept perfectly clean. Occasionally the whole were washed with black soap and water, and thus were prevented all irritation of the skin and loss of hair.

The food of the cattle, for the first few weeks, consisted of carrot and turnip-tops, then the common turnip, afterwards the Swedish; this was succeeded by cole, which lasted till the 10th of June; afterwards clover. An allowance of straw with a small portion of boiled chaff was given occasionally. For the last month, a few pounds of oil-cake were given daily. Turnips were valued at three half-pence per stone; clover at one penny. The expense of feeding was most commonly under six-pence per day.

The value of the land from whence the produce was drawn may be estimated at forty shillings per acre. A deduction from the supposed profit must be made for risk, capital, and taking to market.

The gain of animals in weight will not be found to be governed

governed by size:—For instance, the short-horned, which exceeded one-third in size some of the other specimens, do not gain in daily increase more than lesser animals. Small animals consume less food, but the improvement upon the original weight will give the preponderance to the larger animals, supposing an equal aptitude to fatten.

The little experience I have had in stock, precludes my offering any opinion of my own. I shall be happy to afford the Society any further information or explanation they may wish.

I have the honor to be, Dear Sir,

Your obedient humble Servant,

J. C. CURWEN.

Workington, Dec. 2, 1809.

To C. TAYLOR, M. D. SEC.

P. S. I shall have the honor of submitting to the Society the result of my experiments on earth, saturated with urine, as a substitute for manure.

A CERTIFICATE was received from THOMAS THOMPSON, Bailiff to Mr. Curwen, confirming the correctness of the annexed account of the respective weights of the experimental cattle fed at the Schoose Farm from the 1st of October, 1808, to the 30th of September, 1809.

A CERTIFICATE was received from WILLIAM GLOVER, Head-feeder of milch cows at Schoose Farm, confirming the accuracy of the annexed account from Mr. Curwen, respecting the quantity of food given to the various experimental cattle fed at the Schoose Farm from the 1st of October, 1808, to the last day of September, 1809, and that it was regularly entered and weighed by him.

ACCOUNT

ACCOUNT FROM J. C. CURWEN, ESQ.

OF

The Food consumed, and of the respective Weights of the Experimental Cattle fed at the Schoose Farm,

FROM OCTOBER 1, 1808, TO SEPTEMBER 30, 1809;

WITH THE PROFITS ON EACH.

[*To face page* 36.

	Weight, Oct. 1, 1808.	Weight gained Sept. 30, 1809.	Consumption of Green Food by each.	Consumption of Straw, Chaff, &c. by each.	Consumption of Oil-cake.	Quantity of Water by each.	Daily increase of Weight.	Green Food consumed for the gain of each lb.	Dry Food consumed for the gain of each lb	Cost of Food.	Cost of each lb. gained.	Profit.	
	St. lb.	St. lb.	St. lb.	St. lb.	St. lb.	Gal. Qts.	Oz.	St. lb.	lb.	£. s. d.	d.	£ s. d.	
No. 1.	64 0	22 0					13	7 5½	8¾		6	5 1 4	No. 1.—64st. at 4s. . 12 16 0 Expense of Food . . 7 18 8 20 14 8 86st. at 6s. . . 25 16 0 Profit 5 1 4
HEREFORD.			2,265 12	191 8	6 6	25 1				7 18 8			
No. 2.	61 7	28 7					17½	5 10¾	7½		4¾	6 15 4	No. 2.—61st. 7lb. at 4s. 12 6 0 Expense of Food . . 7 18 8 20 4 8 90st. at 6s. . . 27 0 0 Profit 6 15 4
No. 1.	78 7	25 7			6 6		15½	6 9	8	8 3 9½	5½	7 6 2½	No. 1.—78st. 7lb. at 4s. 15 14 0 Expense of Food . 8 3 9½ 23 17 9½ 104st. at 6s. . . 31 4 0 Profit 7 6 2½
SHORT-HORNED.			2,362 1	187 12		28 3							
No. 2.	90 0	25 0			0 0		15	6 10	8½	7 11 3½	5	8 18 8½	No. 2.—90st. at 4s. . 18 0 0 Expense of Food . 7 11 3½ 25 11 3½ 115st. at 6s. . . 34 10 0 Profit 8 18 8½
No. 1.	61 7	24 7					15	6 11	8½		5½	5 10 5	No. 1.—61st. 7lb. at 4s. 12 6 0 Expense of Food . 7 19 7 20 5 7 86st. at 6s. . . 25 16 0 Profit 5 10 5
GLAMORGAN			2,307 0	186 12	6 6	26 0				7 19 7			
No. 2.	52 7	20 7					12½	8 0	10¼		6½	3 8 5	No. 2.—52st. 7lb. at 4s. 10 10 0 Expense of Food . 7 19 7 18 19 7 73st. at 6s. . . 21 18 0 Profit 3 8 5
No. 1.	54 0	17 0					10	9 0	12½		7½	2 16 6¾	No. 1.—54st. at 4s. . 10 16 0 Expense of Food . 7 13 5¼ 18 9 5¼ When sold, 71st. at 6s. 21 6 0 Profit 2 16 6¾
GALLOWAY.			2,174 12	186 8	6 6	23 3				7 13 5¼			
No. 2.	54 0	22 0					13½	7 0	9		6	4 6 6¾	No. 2.—54st. at 4s. . 10 16 0 Expense of Food . 7 13 5¼ 18 9 5¼ 76st. at 6s. . . 22 16 0 Profit 4 6 6¾
No. 1.	76 0	18 0					11	9 6	10½		7¾	4 19 9¾	No 1.—76st. at 4s. . 15 4 0 Expense of Food . 8 0 2¼ 23 4 2¼ 94st. at 6s. . . 28 4 0 Profit 4 19 9¾
LONG-HORNED.			2,368 0	169 0	6 6	31 2				8 0 2¼			
No. 2.	74 7	21 7					13	7 8	8¾		6¼	5 17 9¾	No. 2.—74st. 7lb. at 4s. 14 18 0 Expense of Food . 8 0 2¼ 22 18 2¼ 96st. at 6s. . . 28 16 0 Profit 5 17 9¾
SUSSEX.	69 0	18 0	2,268 2	107 8	0 0	21 0	11	9 0	6¾	6 14 5	6¼	5 11 7	69st. at 4s. . . 13 16 0 Expense of Food . 6 14 5 20 10 5 87st. at 6s. . . 26 2 0 Profit 5 11 7

Account from J. C. CURWEN, *Esq. of the Gain and Loss in Weight from feeding the Experimental Cattle at the Schoose Farm, upon the different Green Food, from October* 1, 1808, *to September* 30, 1809.

	Carrot-tops, Food for Twenty-nine Days.			Turnip-tops, Food for Thirty-seven Days.			Turnips, Food for Ninety-two Days.		Swedes, Food for Thirty-two Days.		Cole-plants, for Fifty-nine Days.			Grass, for Twenty-eight Days.		Clover, for Eighty-eight Days.	
	Total Gain.	Daily.	Loss.	Total Gain.	Daily.	Loss.	Total Gain.	Daily.	Total Gain.	Daily.	Total Gain.	Daily.	Loss.	Total Gain.	Daily.	Total Gain.	Daily.
	St. lb. oz.	lb. oz.	St.	St. lb. oz.	lb. oz.	lb. oz.	St. lb. oz.	lb. oz.	St. lb. oz.	lb. oz.	St. lb. oz.	lb. oz.	lb. oz.	St. lb. oz.	lb. oz.	St. lb. oz	lb. oz.
No. 1.	2 0 0	0 15½	—	0 9 6	0 4	—	5 10 0	0 13¾	1 9 0	0 11½	4 9 10	1 1¾	—	2 3 0	1 1½	4 6 0	0 1¼
HEREFORD.																	
No. 2.	5 7 0	2 10½	—	—	—	8 6	8 3 4	1 4	0 11 0	0 5½	3 7 0	1 11¼	—	2 10 0	1 0½	5 8 0	0 14
No. 1.	—	—	3	2 7 6	0 15	—	4 8 0	0 11	1 0 0	0 7	4 6 0	1 0¾	—	6 4 0	3 2¼	4 9 0	0 13
SHORT-HORNED.																	
No. 2.	—	—	2½	0 6 8	0 2¾	—	7 9 0	1 2¾	4 0 0	1 12	3 12 0	0 14½	—	2 4 0	1 2¼	4 0 0	0 10
SUSSEX.	—	—	3	3 12 0	1 7¼	—	5 10 0	0 14	2 2 0	0 15	3 2 8	0 12	—	1 10 0	0 13½	3 0 0	0 7¾
No. 1.	2 0 0	0 15½	—	—	—	9 0	4 0 0	0 9½	1 10 0	0 12	1 2 0	0 4¼	—	2 11 0	1 6	4 9 0	0 13
LONG-HORNED.																	
No. 2.	1 7 0	0 11½	—	—	—	9 0	5 13 0	0 14½	2 2 0	0 15	—	—	7 0	4 12 8	2 6¾	5 13 8	0 15
No. 1.	1 7 0	0 11½	—	4 0 0	1 8	—	5 8 0	0 13½	3 6 0	1 8	1 12 8	0 7	—	4 2 0	2 1	3 9 0	0 8
GLAMORGAN.																	
No: 2.	1 7 0	0 11½	—	1 10 0	0 10¼	—	5 5 0	0 13	3 6 0	1 8	3 3 0	0 12	—	3 7 0	1 12	3 0 0	0 7¾
No. 1.	—	—	—	1 7 0	0 9	—	2 7 0	0 6	3 0 0	1 5	3 7 0	0 13	—	2 0 0	1 0	1 0 0	0 2½
GALLOWAY.																	
No. 2.	1 7 0	0 11½	—	3 7 0	1 5	—	7 7 0	1 2¼	2 0 0	0 14	4 0 0	0 15	—	3 0 0	1 8	4 0 0	0 10

*** It must be observed, that for one fortnight all the Cattle lost weight on Clover, owing to its being deprived of nutrition from wet. From the 14th of July to the last of September, there was scarce a dry day.

The SILVER MEDAL *of the Society was this Session voted to* J. BERNEY PETRE, *Esq. of Westwich-House, Norfolk, for extensive Plantations of Pinaster Fir Trees. The following Communications on this Subject, and on Plantations of Chamomile, were received from him, and a fine Specimen of the Timber of the Pinaster is preserved in the Society's Repository.*

GENTLEMEN,

HAVING been a planter of firs and forest-trees for more than fifty years, upon a large scale, my friends have often solicited me to lay the particulars before your Society, as few in this kingdom have exceeded me in this pursuit. I am at length induced to lay my labours before you in the following statement:—About thirty years ago I planted in my park, and on the heath adjoining, about two hundred acres with different trees; the soil of the latter was so poor that the Scotch firs, which I chiefly appropriated to that place, died after having been planted fifteen years, owing to the poverty of the soil and their exposed situation. The pinaster, or Chester pine, has always been a favorite tree with me for the beauty of its foliage and goodness of the timber. I have in my groves I believe some of the finest in the kingdom, estimated by Mr. Nathaniel Kent, of Craig's-court, a member of your Society, as containing five loads of timber in a tree, and upwards of eighty feet high; it therefore occurred to me to raise some young plants from them, and when these plants were two years old, I filled up with these young pinasters the vacancies occasioned by the death of the Scotch firs, and

though

though planted sixteen years after them, they are now by far the largest and handsomest trees. A very few years since, upon observing the rapid growth of these trees, I was induced to enlarge my plantations, and took into my park two hundred acres more, which I planted entirely with pinasters, except in the vallies where other trees grow: my pinaster plants were all raised from my own seed; and this year their progress has been astonishing, and they are the admiration of all persons who have seen them.

I am preparing to add another hundred acres, and have raised above two hundred thousand plants for that purpose. I shall then have a plantation of five hundred acres, with a five-mile drive through it. When I finished my second planting, about three years since, I found there was nearly forty thousand plants left, and as at that time I did not mean to extend my plantations, I thought it was a pity that such valuable plants should be wasted. I therefore agreed with one of my gardeners to dispose of them, and a friend in London took upon himself the trouble. There was an immediate demand for three times the number, and some were sent to Scotland, Ireland and Wales; in consequence of which, I last winter ordered as much seed to be gathered and picked out by poor women and children, in my parish, as cost me upwards of twelve pounds. I have, therefore, raised plants sufficient for all my purposes, and I have I suppose two hundred thousand to spare, which, I have no doubt, will be applied for in the spring. I likewise, some years since, established a large chamomile-ground, I believe the first in Norfolk, and is thought a very laudable pursuit, as it employs the poor of my parish from July till November, and some children will earn, by gathering the flowers only in the middle of the day, from sixpence to ninepence each.

Before I conclude this paper, I beg leave to mention the quick

quick growth of a Spanish chesnut-tree, which I planted, a very small one, twenty-nine years ago last spring, and which now measures near six feet round the body of the tree, at two feet above the ground.

The Rev. St. John Priest, the Secretary to the Norfolk Agricultural Society, has viewed most of my improvements.

I am, with respect, Gentlemen,

Your most obedient Servant,

J. BERNEY PETRE.

Westwich House, Norfolk, Dec. 1, 1809.

To the Society of Arts, &c.

CERTIFICATES.

A letter from the Rev. ST. JOHN PRIEST, Secretary to the Norfolk Agricultural Society, dated Scarning, near East Durham, Norfolk, December 4, 1809, accompanied and confirmed Mr. Petre's statement.

We, the undersigned, being resident at North Walsham, the adjoining parish to Westwich, in the County of Norfolk, have frequent and even constant opportunities of observing and admiring the plantations and improvements of John Berney Petre, Esq., upon his estate there; and having seen the account which he has transmitted to the Society of Arts, &c. of the extent and progress of the same, as well as of his extensive and flourishing chamomile ground, and the benefit and employment furnished by them to the poor, or inhabitants of the neighbourhood, can assure the gentlemen of the Society, that we have no doubt whatever of the correctness of the above-mentioned account which Mr. Petre has

has caused to be laid before them, and that, in our judgment, it appears to fall short of the reality, rather than exceed it.

THOMAS LLOYD, Rector of Westwich, and one of his Majesty's Justices of the Peace for the County.

T. H. COOPER, one of his Majesty's Justices of the Peace for the County of Norfolk.

North Walsham, Dec. 20, 1809.

DEAR SIR,

I AM favoured with your queries, and shall be very happy to give any information in my power concerning the cultivation and nature of the pinaster; I should have had great fears in doing it, had not the latter part of your letter held out some encouragement, being well assured that my observations would not be correct enough for public inspection; I shall therefore just answer your questions as you have placed them. The first of which is, respecting the method of getting out the pinaster seed from the cones;—It is done in the winter by women and children: they put the cones in boiling water, just sufficient to soften the turpentine, and *immediately* upon their beginning to snap they should be taken out, otherwise the water gets to the seed, and injures it; they then strip off every knob separate, with the point of a knife, by which means they easily come at the seed, and by rubbing it well with their hands they quickly break off what surrounds it, which blows from the seed, and leaves that quite clean. I pay them a shilling a pint for it well dressed, including the gathering the cones. I sow them in beds

beds of good mould, not rich, but sifted fine, any time in April, according to the season. I cover them with *sifted* mould, about half an inch thick. I likewise sow the seeds pretty thick, and let them remain a year in the seed-bed; I then plant them out in the nursery-beds, in rows about four inches asunder, and about two inches wide in the rows; the year following they may be planted out for good. This ought to be particularly attended to, for if they remain longer in the nursery-beds than one year, they will draw up weak, and not grow. As to the soil, they will grow on any. I have plants that have made shoots of five feet in two years, where the soil is a bleak, heathy sand at top, and gets down either to a hard strong gravel, or a dead yellow sand; and where they are planted on the declivity of a hill, I have seen the main roots so fleet that they have come out of the surface, and struck in again, two or three feet down the hill, if steep. Having been in the habit of planting pinasters for upwards of forty years, you may justly presume I have them of all sizes. The pinasters, on the above-mentioned poor soil, have been planted about nine years, they measure from ten to twenty inches round, and I have many in my older plantations, that measure from three to four feet round, and their height upwards of forty. The pinasters are planted at such unequal distances, that I do not think the ground could, with any accuracy, be measured so as to ascertain what quantity of timber of the medium growth an acre would contain; but according to my opinion, pinasters planted about seven feet from each other, might stand without being thinned, till they measure from two to three feet in circumference. Those pinasters which Mr. Kent estimated at near five loads of timber in a tree, were planted in the year 1702. The largest are about ten feet in circumference; three feet above the ground they diminish

very gradually, till they get near the top. One I lately felled did not run the length that some of them do; it measured ten feet round at the bottom, eight feet in the middle, and about six where the arms divided at the end of the body. If any of the above observations should be of the least service in forwarding your next publication, I shall be highly gratified, and should any fresh occur, will with much pleasure communicate them.

I remain, Sir,

Your obliged and obedient Servant,

J. BERNEY PETRE.

Westwich House, July 13, 1810.

To C. Taylor, M. D. Sec.

The Gold Medal *of the Society, being the Premium offered in Class 34, was this Session adjudged to* J. Stockdale, *Esq. of Cark, in Lancashire, and* R. Towers, *Esq. of Duddon Grove, in Cumberland, for gaining upwards of Five Hundred and Sixty-four Acres of Land from the Sea, at Windermoor, in Lancashire. The following Communications were received from them.*

SIR,

Having observed that the Society for the Encouragement of Arts, Manufactures, and Commerce, had this year offered their Gold Medal as a premium to the person who should gain the greatest quantity of land from the sea, I take the liberty

liberty of transmitting to you the inclosed particulars, and sketch of an embankment, erected by Mr. Stockdale and myself; and should the Society vote us their Medal for the same, we shall think ourselves highly honoured.

I am, (for Mr. Stockdale and Self) Sir,
Your most obedient humble Servant,

RICHARD TOWERS.

Buddon Grove, near Ulveston,
Nov. 18, 1809.

To C. Taylor, M. D. Sec.

Statement.

Early in the spring, 1807, James Stockdale, of Cark, in the parish of Cartmel, Lancashire, and Richard Towers, of Duddon Grove, in the County of Cumberland, Esquires, employed Mr. Henry Harrison, of Chester, to erect an embankment to inclose a parcel of marsh ground, situate in the parish of Cartmel, called Windermoor, a considerable part of which was covered with salt water every spring-tide, and the whole overflowed several times during the year.

The embankment is about four thousand seven hundred and fourteen yards in length, in some places fourteen feet perpendicular height; in others, not more than six feet high: the outside of the embankment is in general upon a slope of five feet horizontal, to one foot perpendicular; but in many places is run out to a slope of seven to one, where the embankment is highest; four feet wide at top; inside slope two to one, or two feet horizontal to one foot perpendicular; so that where the embankment is fourteen feet in height, and put out to the greatest slope, the base will be one hundred and thirty feet; the whole covered with marsh sod, four inches in thickness on the outside, and two inches on the inside the embankment.

Inside of the embankment is a water ditch to carry off the surface water, and let out at one end by a culvert, faced with stone, four feet broad, by eight inches deep. In order to prevent a wash, the water must be taken out as smooth as possible.

The whole of the land enclosed is five hundred and sixty-four acres two roods, exclusive of the embankment, which is now covered with strong close herbage, affording excellent pasture for cattle, making the whole six hundred statute acres or thereabouts.

The whole cost £5,500.

The embankment hath now been completed fifteen months, and notwithstanding some very high rough tides during the winter, the repairs have not cost more than a few pounds.

About one hundred acres of this ground were in the spring of 1809, fenced in, ploughed and sown with oats, which produced forty-five Winchester bushels per acre.

Since the setting up of this embankment, the outside is very much filled up by the depositing of the sand, on the recess of the tide, many of the creeks and hollow places have filled not less than six feet, so that it is expected in the course of a few years other considerable tracts of marsh may be gained from the sea.

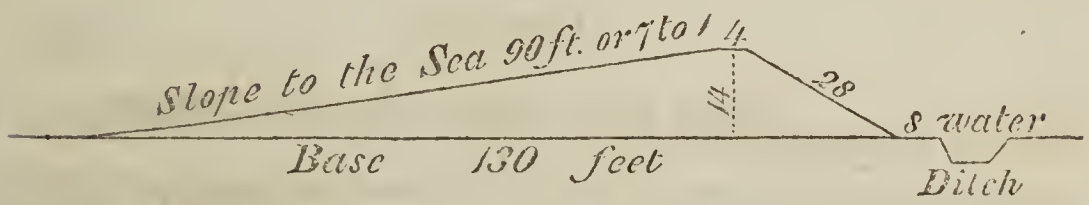
CERTIFICATES, in confirmation of the above statement were received from the Rev. J. BARTON, Rector of Oldingham, and one of his Majesty's Justices of the Peace for the County of Lancaster;

GEORGE BIGLAND, Esq. of Bigland Hall;
GEORGE BIGLAND, Jun. Esq. of Bigland Hall;
JAMES PENNY MACHELL, Esq. of Hollen Oak;

RICHARD

RICHARD MACHELL, Esq. of Ulverston;
REV. PETER RICHARDSON, Minister of Cartmel;
MR. WILLIAM HARRISON, Surgeon, of Ulverstone;
PUDSEY DAWSON, Esq. of Liverpool; and
JOHN WOODBURNE, Esq. of Lowich Hall.

Sketch of the Embankment on Windermoor, Lancashire.



The SILVER MEDAL *of the Society was this Session voted to* MR. THOMAS BALLS, *of Saxlingham, near Holt, Norfolk, for a Screw adjusting Plough. The following Communication was received from him; an Explanatory* ENGRAVING *is annexed, and a complete Model is preserved in the Society's Repository.*

SIR,

I HUMBLY offer, for the inspection of the Society, the model of a plough, constructed upon a principle on which I have made several.

Sir Jacob Astley, Bart. has seen two at work on my farm, which I have constantly used, in different kinds of ploughing, for three years, and which, excepting in the share, have not cost me a shilling in repairs. Sir Jacob has ordered one to be made, and he being desirous that the plough should be more generally known, expressed a wish that I would send a model to the Society. If its mechanical principle proves to be of real utility to agriculturists, and superior to the ploughs in general use, Ishall be highly gratified in my endeavors to promote the liberal views of the Society.

I am, Sir,

Your most obedient humble Servant,

THOMAS BALLS.

Saxlingham, April 5, 1810.

To C. Taylor, M. D. Sec.

Certificates from Sir Jacob Henry Astley, Bart.

DEAR SIR,

I have seen Mr. Ball's plough worked against the common Norfolk plough, and find it much superior. It laid the furrow much better, more equal, and with much less draught to the horses, and has not wanted the usual repairs which the common ploughs are subject to. I make this observation from having had one in use for more than a year;

a year; and I find this plough much approved of by the farmers in this neighbourhood.

I remain, Dear Sir,

Your most obedient Servant,

J. H. ASTLEY.

Milton-Constable, May 3, 1810.

To C. Taylor, M. D. Sec.

SIR,

The inclosed Certificate will I hope be satisfactory to the Society respecting my plough. It is a material improvement over the wheel-plough in common use in Norfolk, as it works with greater ease to the horses, on account of the line of draught being on a line with the angle of the horse's shoulders. It lays the furrow-slice particularly level, and cuts an even bottom-furrow. It is less liable to wear, on account of having less friction on the ground irons. It is particularly well calculated for breaking up stiff old land, and less liable to be put out of order than any plough generally used. By the adjusting screw, the furrow may be set from one to nine inches in depth, and secured by a lock to any of those intermediate depths with the greatest exactness. It may be easily converted into a swing-plough, by disengaging the axle-tree and wheels. Its beam may be made particularly light, on account of the line of draught laying so near the heel. I beg leave to inform the Society that the Earl of Thanet, in the year 1807, ordered two of these ploughs, and in 1809 six more of them. Mr. Burroughs, of Weasenham, intends to have all his ploughs on this plan; also

Mr. Wall, of Bayfield-lodge; Mr. Cobon, of Leatheringsett, will have two ploughs; and the Rev. T. Munnings has given orders for some to be made.

If I had not been so limited in time I could have sent you many more Certificates.

I am, Sir,

Your most obedient humble Servant,

THOMAS BALLS.

Saxlingham, May 6, 1810.

To C. Taylor, M. D. Sec.

Certificates were received from the following persons: viz. Mr. Robert Wright, of Great Snoring, stating that he has three of Mr. Ball's ploughs, which he conceives to be much superior to the common plough, both in the execution of the work and easiness of draught.

Mr. Mark Barret, Farming Steward to Sir George Chad, stating that he has three of Mr. Ball's ploughs; that they are the best he has ever made use of, and answer every purpose, both as a swing or wheel-plough.

Mr. Thomas Hurrell, of Saxlingham, stating his opinion, that Mr. Ball's plough will come into extensive use, being an excellent plough for general purposes.

Mr. Henry May Waller, Farming-steward to Sir Jacob Henry Astley, Bart., stating, that he has two of Mr. Ball's ploughs in constant use; that he thinks them well calculated for strong work; and that they may be converted into a swing-plough, by disengaging the wheels.

Reference

Reference to the Drawing of Mr. Ball's Plough, Fig. 1. *Pl.* 2.

A is the beam of the plough carrying the coulter B, share D, and handle E; F is the mould board; the draught of the plough is taken by two iron rods G, connected at one end with a hook *a* in the beam A; and at the other with an iron bridle H by a swivel-bolt; this iron bridle has several notches to receive the draught-chain I, by means of which the point of traction is adjusted sideways; the adjustment for height, and in which the improvement consists, is made by an iron frame K, at the top of which a nut is placed acting upon a screw *d* fixed into the beam A; the axletree *e* of the wheels *ff* is connected with the iron rods G, by a bolt or pivot projecting from the end of them, which passes through the axletree; by these means the wheels always apply themselves to the inequalities of the ground without influencing the motion of the plough. The nut of the screw *d* being turned, raises or lowers the iron rods G, and elevates or depresses the point of traction, so that the plough will cut a greater or less depth of furrow.

The

The GOLD MEDAL *of the Society was this Session voted to Mr.* J. BAKER, *of West-Coker, near Yeovil, in Somersetshire, for an improved Implement for extirpating Docks and Thistles. The following Communication was received from him. An Explanatory Engraving is annexed, and one of the Implements preserved in the Society's Repository.*

SIR,

I HAVE sent to the Society an implement of my invention for destroying thistles and docks, which are two very injurious weeds to agriculturists.

The implement is so contrived, that if the root breaks in the claw, in attempting to draw it, you may, by turning the instrument, cut the root so far below the turf as to prevent its growth.

I am, Sir,

West-Coker, Oct. 31, 1809. Your obedient Servant,

To C. TAYLOR, M. D. SEC. JOHN BAKER.

CERTIFICATE.

We the undermentioned persons do hereby testify, that the instrument made by Mr. John Baker for destroying docks and thistles has been used to great advantage, and is likely to come into general use.

EDWARD GUPPY.
NATHANIEL BARTLETT.
THOMAS SANDFORD.
EDWARD PENNY.

Mr. J. Ball's Screw adjusting Plough.

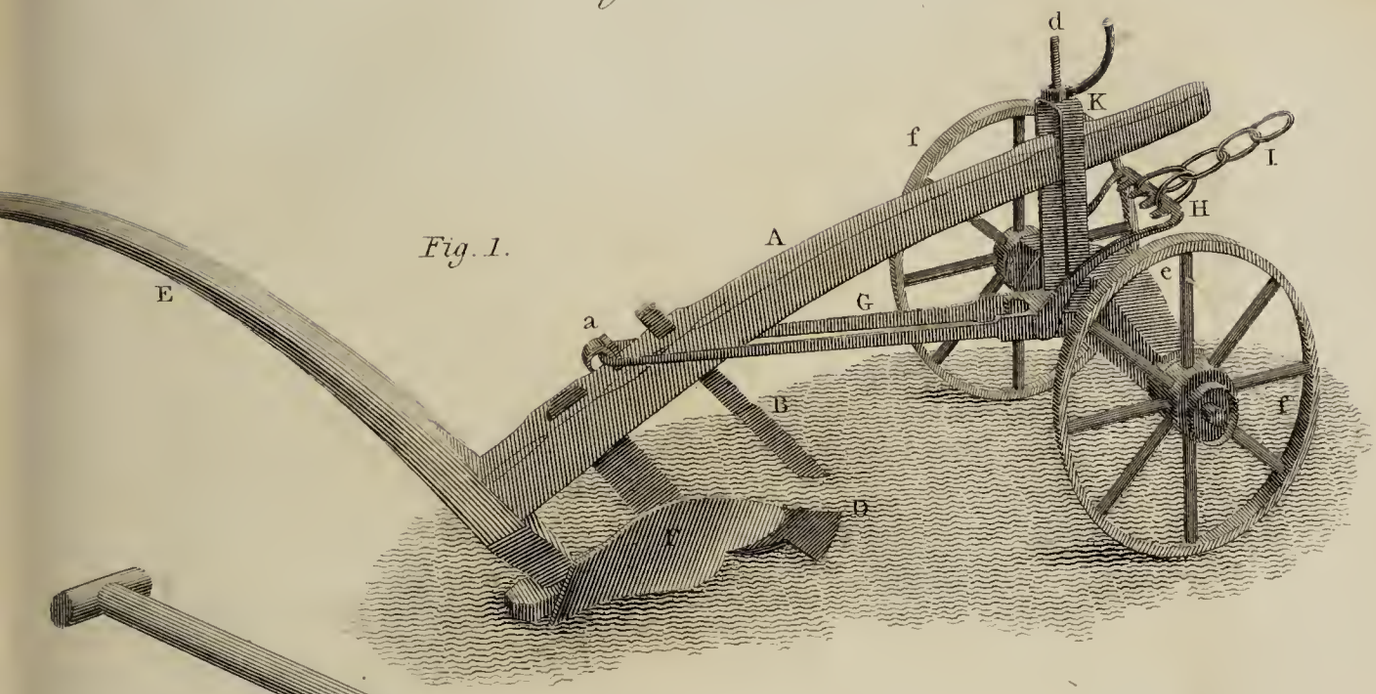


Fig. 1.

Mr. Baker's Thistle Extirpator.

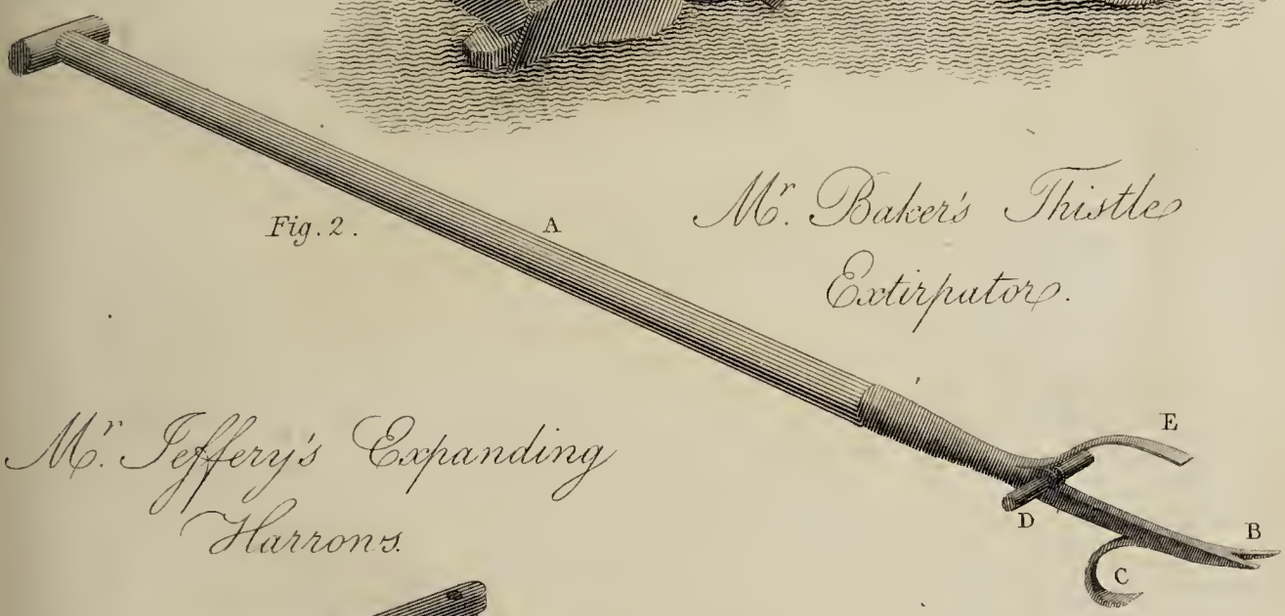


Fig. 2.

Mr. Jeffery's Expanding Harrows.

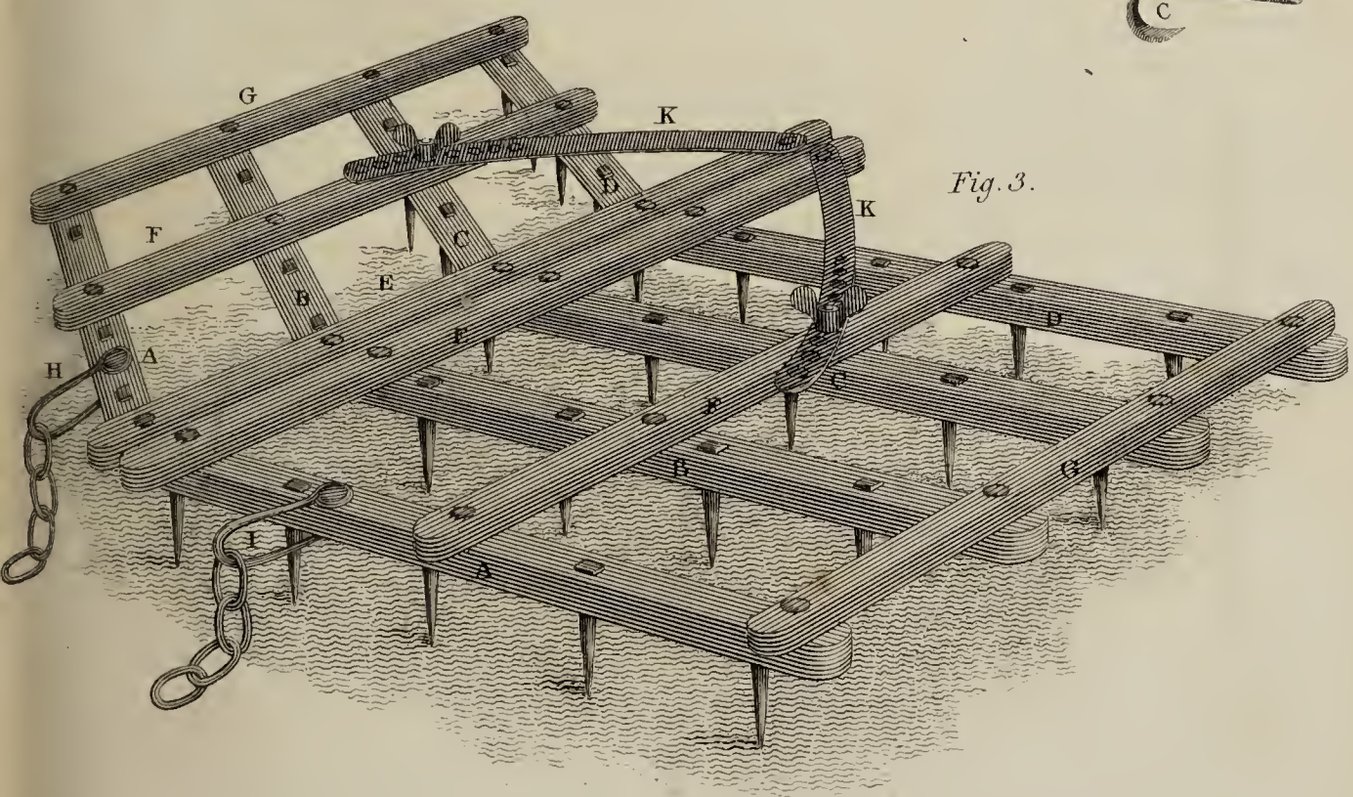


Fig. 3.

Drawn by J. Farey

Engraved by S. Porter

Description of Mr. J. Baker's Implement for extirpating Docks and Thistles, Pl. 2. Fig. 2.

Fig. 2 of Pl. 2, represents Mr. Baker's thistle-extirpator. A is the handle; B the claws, between which the thistle is received; the curved iron C is the fulcrum, over which the purchase to extract the weed is obtained; D is an iron rod, or bar, upon which the foot is placed to thrust the claws into the ground. In case the root of the weed breaks in endeavouring to extract it, the curved blade E, which has a sharp end like a chissel, is thrust into the ground to cut off the root of the thistle some inches below the surface, and prevent its vegetation.

The SILVER MEDAL *of the Society was this Session voted to Mr.* WILLIAM JEFFERY, *of Cotton-End, Northampton, for a Pair of Expanding Harrows, applicable both for cleaning foul Land and harrowing in Seeds. The following Communication was received from him. An Explanatory Engraving is annexed, and a Model of the Harrow preserved in the Society's Repository.*

SIR,

I HAVE sent, for the Society's inspection, a model of a pair of harrows of my own invention, made to a scale of one inch and a half to a foot, and which are allowed to be a great improvement in these implements.

The

The improvement consists in their power of contraction or expansion, so as to cover an extent of land from five feet to ten feet; their teeth may be set at twelve different distances between them, and their tracks will always be at equal distances, according to the state of the land; they will either serve for harrowing in seeds, or cleaning foul land.

For cleaning foul land this harrow far exceeds any other yet made; for in such land the teeth ought to be at a greater distance in the first harrowing, and at the subsequent harrowings to be brought nearer together by degrees, till the teeth are brought very near together by contracting them. One pair of my harrows answer the purposes of three or more pairs made upon the old construction with fixed teeth.

My harrows are so constructed as to be contracted, or expanded, in two or three minutes, and the teeth, which are thirty-four in number, set at any equal distances required, having only two screws to confine them. This implement is more durable than other harrows, as there are no mortices or tenons in them to weaken the wood-work, or admit the rain, they are put together with iron nuts and screws.

They are also easier conveyed from field to field than other harrows, and when not in use will fold up in a small compass. I hope they will meet the Society's approbation, and be rewarded according to their merit.

I remain, Sir,

Your humble Servant,

WILLIAM JEFFERY.

Cotton-End, Northampton,
June 8, 1807.

To C. Taylor, M. D. Sec.

On

On the 31st of March, 1810, CERTIFICATES were received from Mr. JOHN RICE, Cotton-End; Mr. J. HAWKINS, Castle-Ashby; and Mr. WILLIAM SHAW, Hardingstone, to the following effect: viz.—That they had purchased of Mr. William Jeffery, and made perfect trials of his newly-invented expanding harrows, and find them to be upon a much superior principle to any they have seen, or made use of, before, and that they possess the following advantages:—

1. That by their contraction or expansion, as required, the teeth may be set at any equal distance, according to the state of the soil.

2. That they are much stronger and more durable than any other, as there is no mortice or tenon to weaken the wood-work, or harbour wet.

3. That they will fold up in a small compass, and are much easier to be moved about, and take up less room when out of use than any other harrows.

Reference to Mr. W. Jeffery's Expanding Harrows.

Fig. 3, Pl. 2, represents Mr. Jeffery's expanding harrow. It consists of two sets of moveable bars of wood, connected by hooks in one set, and eyes in the other. Each set is composed of four bars of wood, A B C D, furnished with teeth; these are connected, and held parallel to each other by three other bars, or braces, E F G, united to the former by screw-bolts; the iron loops H I are the points for the chains, by which they are drawn; K are two iron braces, joined to the bars E at one of their ends, and have a number of holes, any of which can be put over screw-pins fixed upon the middle bar F, provided with nuts;

nuts; when these nuts are removed, and the iron braces detached from their pins, the frames may be either closed up, or extended, so as to bring the teeth of the harrow nearer together, or remove them farther asunder, and they can be fastened at any point by the different holes in the iron braces, so as to be worked with the teeth at any requisite degree of extent.

The SILVER MEDAL *of the Society was this Session voted to Mr.* JOSEPH HUTTON, *Jun. of Ridgway, near Sheffield, for an improved Reaping-Hook for Corn. The following Communication was received from him, and the Implement preserved in the Society's Repository.*

SIR,

AT a time like the present, when all foreign supplies of grain are cut off, nothing can be more acceptable to the public than useful discoveries and improvements in agriculture. I am therefore anxious to contribute, in some degree, to that end, by sending some remarks on reaping the harvest, accompanied with my new-improved reap-hook.

I have, for the last eight years, had an opportunity of inspecting the different modes of reaping the harvest in many parts of Great Britain, and I have also had information on the subject from various parts of Europe and America on respectable authorities.

I will first endeavour to describe the different kinds of implements used for this purpose, some of them being employed

ployed in one part of the kingdom, and not in another. The sickle is of the greatest antiquity, though its use is now much upon the decline in England. It is almost in the form of a half circle, from twenty to thirty inches long, about three-fourths of an inch broad, with teeth cut in the edge from twenty to thirty in an inch, inclining from the handle to the point. The scythe is an instrument so generally known, as to need no description, further than that some are made longer, and others broader, as necessity or caprice requires.

The common reap-hook is a half-circular piece of iron and steel, from twenty to thirty inches long, about one inch and a half broad, and has a smooth even edge, like unto a scythe.

The badging or baging-hook is broader than the common reap-hook, particularly at the point, where it is most used, and straighter than the sickles, or reap hooks, generally are.

The reaping of wheat with the sickle is yet continued in Yorkshire, Durham, Westmorland, Cumberland, Lancashire, Warwickshire, Leicestershire, Northamptonshire, Rutland, Nottinghamshire, and part of Lincolnshire; it is performed by putting the sickle into the corn with the right hand, meeting it with the left hand, gathering the corn into the elbow of the sickle near the right hand, holding the corn fast with the left hand until it is cut, then the person repeats his cutting till he has obtained a large handful, which is generally one-third of a sheaf, which he lays in the straw-binding ready prepared.

The common reap-hook is used in the manner above specified, but its effects are far different, the sickle having a toothed-edge does not cut such stems as are not immediately collected into the left hand; for it is impossible to collect all where dispatch is required, particularly in thin straggling crops,

crops, for the teeth of the sickle being inclined, it is not so sharp in cutting from point to handle, as from handle to point, which is evident from a feel with the finger. The reap-hook, having a smooth even edge, cuts both ways alike, and cuts the straggled stems before they are collected into the gathering hand, consequently the loss of grain is great. The hook is allowed to perform its work with more ease than the sickle, which perhaps accounts for its now being so general, nothing else being used for cutting wheat in the following counties:—Cornwall, Devon, Dorset, Somerset, Monmouth, South-Wales, Hereford, Wilts, Hants, Berkshire, and part of the adjoining counties; it is also much used in Norfolk and Lincolnshire, also Northumberland, Westmoreland, and South of Scotland. It has lately been introduced into the North of Ireland by Irishmen who have laboured in Scotland, likewise into the Indies for cutting rice.

The badging-hook is used about London, and in the West of England, its work is performed by the man holding the hook in his right hand, and while, with the left, he reclines the stems intended to be cut upon the standing corn, which supports it when cut, he repeats his cutting from his right to his left hand, and collects it from his left to his right, which is almost a sheaf.

Badging is an expeditious mode of reaping; the corn is cut very low as if mown, and answers were straw is valuable; it may be said that badging produces more manure, from the greater quantity of straw collected; but in stiff clay lands a longer stubble is perhaps necessary to be left, to render the land lighter for the following crop. The badging-hook is also used for cutting oats in Lincolnshire and Staffordshire, and where labourers can be procured, is preferable to the scythe, being expeditious in its work, and less loss attending

its

its use, the corn is gathered in straight regular order, which is not the case with the scythe; for the scythe requires at least two persons to follow it to bind the corn in sheaves, besides raking the stubble. The corn after the scythe lies in very irregular order, and holds more moisture in wet weather; besides, the scythe is destructive to the ripe corn, for its heavy stroke strips from the entangled stems the best and ripest grain.

The labourer seldom considers the interest of his employer, but generally uses such a tool as will do the work with most ease to himself.

I offer my improved reap-hook to the public, with a view to prevent the loss of grain, and at the same time to be used with ease by the labourer. It has a smooth edge like the reap-hook, from the handle of it towards its middle, where the corn is gathered; the other part has a toothed edge, like a sickle, and it will not scatter the corn so much as either of the other implements.

I shall furnish Certificates to show that I am the inventor of it, and that it has considerable advantages in general use. It is a great preserver of corn, in harvest, where it is straggled much from heavy rains.

I am, Sir,
Your obedient Servant,
JOSEPH HUTTON, Jun.

Ridgway, near Sheffield,
Oct. 17, 1809.

To C. Taylor, M. D. Sec.

The following Certificates were received.

A Certificate from Mr. J. Turner, of Ridgway, dated October 3, 1809, stating, that in the year 1805 he

had made two dozen of improved reap-hooks by Mr. Hutton's instructions; that they were the first he ever knew to be made upon this plan, and that in the present year he and others have made thirty-five dozen for him.

A CERTIFICATE from WILLIAM TAYLOR, of Summit-Lodge, in Yorkshire, Bailiff to G. F. BURTON, Esq. dated September 29, 1809, stating, that after a few seasons experience, he finds Mr. Hutton's reap-hook preferable to any other, from the nature of its edge; that the labourers under his superintendance used all of this sort the last season, and that it is found to be a great saver of corn.

A CERTIFICATE from JOHN BOOTH, scythe, sickle, and reap-hook manufacturer, Ford Mills, near Sheffield, dated October 12, 1809, stating, that Mr. Hutton's reap-hook is certainly superior to the common one, and that public opinion confirms it as such, for there has been a great demand for them the two last harvests.

A CERTIFICATE from Mr. EDMUND LITTLEWOOD, of Dent Hall, near Dronfield, dated October 15, 1809, stating, that Mt. Hutton's reap-hook is superior to the common ones now in use, especially in the last harvest, in which the crops have been remarkably straggled, and bad to reap, owing to the heavy rains and winds.

That the common reap-hooks cut whilst putting in, before the gathering hand hath collected the stems together, and consequently many drop and are lost; which is not the case with Mr. Hutton's new-invented reap-hook, which doth not cut before the stems are collected together into the gathering hand.

PAPERS

IN

CHEMISTRY.

The GOLD MEDAL *of the Society was this Session voted to Mr.* ISAAC JOPLING, *of Gateshead, Durham, for Searching out and Working Quarries of British Marble. The following Communications were received from him, and the Specimens of the different Marbles are preserved in the Society's Repository, and are intended to decorate their Great Room.*

SIR,

IN a letter of last June, from my good friend Mr. Charles Waistell, of High-Holborn, I received, inclosed, a List of Premiums offered by the Society for the Encouragement of Arts, Manufactures, and Commerce,—in pages 18 and 19 he had marked for my notice the Society's resolutions and regulations concerning specimens of British marbles. So far back as the year 1780 I began the business of marble-

mason here, at Gateshead, in the county of Durham, which I have carried on ever since with some degree of success. In the year 1798 I was informed by my marble-merchant, who supplied me with foreign marble, that the French had got possession of Carrara, and that it was not likely that marble could be again imported into England from Italy for many years. As I had, from the writings of Camden, Knox, Pennant, Williams, and others, obtained a knowledge that there was white marble in Sutherlandshire, I made an agreement with the Countess of Sutherland, and the Earl Gower, for a lease of the marble quarries to be found in the county of Sutherland; and in May, 1799, I carried several Englishmen north, to search for marble. I spent seven summers and two winters in Assynt, a parish situated in the north-west corner of Sutherlandshire, not less than fifty miles from a market-town, where there had never been a road, a cart, or a smith who could shoe a horse, during which time I opened many quarries of marble, and made, at least, fourteen miles of road, through heretofore impassable mosses, bogs and rocks, to the sea. The difficulties and disadvantages I have laboured under were innumerable; meat, coals, iron, and every article were to fetch from such a great distance; and the people, "torpid with idleness," as Mr. Pennant expresses it in his Tour, and to which I refer for a description of this place, would do nothing for me without an exorbitant price, and never till it suited their own convenience; and from having no markets, and not being in the habit of selling, they could never be persuaded to part with any article at less than nearly double its worth. To help forward the road, I was, indeed, allowed the statute labor of the parish; but, after trying them awhile, so averse were they to work, that I refused to receive them, rather choosing to finish the road with my own men. The first summer

summer was spent in trying and searching after quarries; the second, third, and fourth was spent in making this road, which road Lord Reay passed about seven years ago, and last summer Mr. Anderson, a son of Dr. Anderson, who published the *Bee*; each of these can tell what an arduous task it was to make a road in such a country; and I believe they are both members of your's or the Royal Society. In 1806 I visited Ashford, in Derbyshire, to see the machinery there for sawing and polishing marble, and had a model made in London, like one which I saw that year in your rooms, said to be the model of a machine working at Torbay; my intention was to have had such-like machinery erected near the quarries, and to have dwelt there, and superintended the works; but not meeting with the encouragement which I needed from the proprietors, or rather from the manager of their estates, I did not afterwards return to Assynt, as I saw clearly it was only throwing away more money where I had already expended far too much for one individual to venture. I however still keep men at the quarries, and have since that time got one sloop-load of marble brought away, and have another nearly ready, and have yet ten years of my lease unexpired. I have sent you a set of specimens, the produce of these quarries, and several other kinds of British marbles which I had by me. They are made 8 inches by 6, and 1 inch thick, except some that had been cut for veneers; yet, nevertheless, I backed them to the thickness with stone, and sent them also; they are as follows:—

No. 1. A white marble that will saw and work with a tool, but takes a bad polish. I sunk several yards deep in this quarry, but could not find it better. About ten years ago, I proposed this marble to A. Davison, Esq. for building the Naval Pillar then subscribing for, and he and I exchanged two or three letters upon the subject; since that time I got

Mr. James Smith, who is now making Lord Nelson's monument, to carve a small head of this marble, which I believe is now in the possession of Mr. Atkinson, architect. This may prove a useful stone, but cannot be got in large blocks; and it has some narrow blue veins scattered through it. Nos. 2, 6, 8, 12, 14, and 16, are the produce of those quarries near No. 1; these all saw, work and polish easily, and can be got pretty large, and are all situated near half a mile up the sloping side of a hill. No. 4, is from a quarry close by, and under a small river, near half a mile from the former seven. In dry weather I have seen this marble bare six or seven yards by four or five, but it had all the appearance of being cracked. Although I have sent but one specimen of this kind, yet there is considerable diversity in the quarry, and it is compact, fine, and easy to work and polish, and is the very marble Williams described in his Mineral Kingdom, as pure white marble, fine as the Parian, and to be had of any size, without cracks or flaws, and situated under the bed of a small river, near a quarter of a mile from the house of Ardlock: this is exactly the situation; but for its being pure white, large, and solid, no doubt he fell into these errors by seeing its surface bleached by the weather, and making no further examination. I had people working here above a year, but never could get sound blocks of it large enough for chimney-hearths; no doubt larger blocks might be had by going deeper. I have seen some of this burnt to a very fine lime, and because it would make lime the inhabitants laughed heartily, to think a man should travel so far, and mistake his aim so much, as to take limestone for marble; for though they have a burn called in Gallic, *Aull na Marable*, (Marble River), they had no idea of marble when they saw it. No. 10, is got near a quarter

of

of a mile further down the river, and is very hard to saw, work and polish: this water is called Lyne, and the place Ledbeg, and I suppose it is fourteen miles from hence to the sea at Unapool, where there is a very safe natural harbour, where sloops may lie secure in any weather, and take in a cargo from the end of a rock which projects a little into the sea; the surface of this rock I levelled to serve as a pier, and to this place I made the road. Nos. 3, 5, 7, 9, 13 and 15, are from quarries at Coubin, a place upon the said road about seven miles from the sea: these marbles, with some others in their vicinity, I discovered entirely myself, as it was never supposed there was any marble there, and that at Ledbeg it was, by those who wrote, supposed to be white. When I showed this Coulin marble to workmen in London, and fell into conversation with them about it, they seemed all to think it unique: it is hard to work and polish, but beautiful, and when polished will retain it much better than softer marble; and I hope the public will rank these among the best foreign coloured marbles. All these sixteen are specimens of the quarries I have opened; there are several other kinds in the district, but not so well situated for bringing away. Of these marbles I have made many chimney-pieces, particularly for Donald M'Leod, of Granus, Esq. Sheriff of Rossshire; Sir George Mackenzie, of Coul, Rossshire; Colonel Duff, of Fetteressoe, Aberdeenshire; Colonel Mitford, Exbury, near Southampton; and Admiral Sir Samuel Hood, London. I sent also several other chimney-pieces, made of it, to London, of which I believe the Duke of Athol got one to send to the Isle of Man, but for an account of the others, and of several that were made of it by workmen in London, I beg leave to refer to William Atkinson, Esq. Architect, No. 20, Bentinck-street, Cavendish-square, to whom I am much indebted for having re-

commended it. Nos. 17, 18, 19, 21, and 22, are varieties of serpentine from Portsoy, in Banffshire, which place I visited before I went to Assynt: this rock runs right into the sea, and I was of opiniou that large blocks were not to be procured. In the middle of this serpentine runs a very coarse marble, a specimen of which I have sent, marked 20. No. 23, is a specimen of the Duke of Argyle's marble from the Isle of Tyrie; this is a beautiful marble, and I once, long ago, went from this place to Edinburgh on purpose to see a sloop-load of it, but they would not sell it under three guineas and a half per solid foot, for which reason it never made its way into use. Nos. 24 and 25 are from Kilkenny, in Ireland; 26 from a place called Gallow-hill, 27 from Belsay-castle, both in Northumberland; this last belongs to Sir Charles Monk, and can be had sound almost any size. 28, 29, and 30, are from Frosterly in Weardale, in the county of Durham; these are taken from a thin stratum of the great limestone which stretches far through this county, and is to be seen both in Teasdale and Weardale. 31 and 32 are both from above Wearhead, but I believe cannot be got large, as far as I made trial; and no person knew of it, or ever attempted to work it but myself, about thirteen years ago. 33, 34, and 35, I suppose are from Devonshire. No. 36, Derbyshire-grey: this marble rises large in the bed, but so thin that they seldom get more than one slab out of one block, as I was informed by the proprietor of the marble-works at Ashford.

I am exceedingly sorry that I was so late in obtaining a knowledge, that the Society had a wish to encourage a search after British marbles: these specimens might have been produced ten years ago, and perhaps such a sale for this marble might have been promoted as would have reimbursed me for the expenses I have been at, the hardships I suffered

suffered in seven years personal attendance upon a search for marble, in such a country, where, from bad houses and a wet climate, I was seldom dry, day or night, except in fine weather, of which there is but little, and for the loss my own business has sustained here in my absence. To this account of expense, hardship and loss, I might add a little of vexation in having my tools broken, and frequently thrown into bogs; corn sown in my road; my oxen hunted before my face, for miles, with their dogs, and my grass eaten by their cattle for whole summers together. This sketch may show how anxious I have been to bring forward this marble, though only an individual, having no funds but the savings made from during twenty years a business not very extensive.

As I live in the north of England, and have quarries in the north of Scotland, if I can be of any use to the Society in helping to promote their views in regard to British marbles, I shall be happy to serve them; and if they think the Sutherland marbles worth encouragement, I hope they will endeavour to bring them into notice.

I am, Sir,

Your obedient Servant,

ISAAC JOPLING.

Gateshead, Feb. 17, 1810.

To C. Taylor, M. D. Sec.

Specimens

Specimens of British Marbles sent to the Society, by Isaac Jopling, of Gateshead, Durham, February, 1810.

Number.	Colours.	Situation and Quality.	By whom Discovered.
1, — — — — 2, 6, 8, 12, 14, 16	White. } Grey & White. }	The produce of four Quarries near each other, about half a mile up the sloping side of a hill. These all saw and polish easily except No. 1, and may be all got in pretty large blocks, except No. 1, situated in the Parish of Assynt, Sutherlandshire.	Supposed to have been known to travellers; but the Quarries were first opened by Mr. Jopling.
4, — — — —	Light-grey.	Situated close by, and under a small river, near half a mile from the former seven specimens, a quarter of a mile from the house of Ardlock, Parish of Assynt, Sutherlandshire.	Described by Williams, in his Mineral Kingdom, as pure White, fine as Parian.
10, — — — —	White, with small green and red veins.	Near a quarter of a mile farther down the river, very hard to saw, work, and polish. The river is called Lyne, and the place Ledbeg, fourteen miles from hence to the sea, at Unapool, where there is a very safe, and natural harbour.	Quarry first opened by Mr. Jopling.
3, 5, 7, 9, 11, 13, 15	Variegated with red, brown, black, and white.	From Quarries at Coulin, a place upon the said road, seven miles from the sea.	Discovered by Mr. Jopling, not known before.

17, 18, 19, 21, 22	Red and Green.	Varieties of serpentine from Portsoy, in Banffshire.	
20, — — — —	White and Grey striped.	A vein in the middle of the above serpentine.	
23, — — — —	Pale Red, with black spots.	From the Island of Tyrie, belonging to the Duke of Argyle.	
24, 25, — — —	Black, with white shells.	From Kilkenny, in Ireland.	
26, — — — —	Grey.	From a place called Gillow-hill, Northumberland.	
27, — — — —	Grey.	From Belsay Castle, Northumberland, belonging to Sir Charles Monk. The blocks may be got large, and it is easy to work.	
28, 29, 30, — —	Grey.	From Frosterly, in Weardale, in the County of Durham, the blocks large, and easy to work.	
31, 32, — — —	Black and Grey.	From above Wearhead, in the County of Durham.	Discovered by Mr. Jopling thirteen years ago.
33, 34, 35, —		From Devonshire.	
36, — — — —		Derbyshire-grey.	

The THANKS *of the Society were this Session voted to the* DUBLIN SOCIETY *for various Specimens of Irish Marbles presented by them.*

The THANKS *of the Society were also voted to Lieutenant-General* CHARLES VALLANCEY, *Vice-President of that Society, for the following Communication on the subject. The Specimens of the Marbles are preserved, and are intended to decorate the Great Room of the Society.*

SIR,

I HAVE this day sent to our ship-broker a box, containing twenty-nine specimens of Irish marbles for the Society of Arts, &c. and hope, in a short time, to forward some more; they are, I am sorry to observe, chiefly procured from the tops of quarries, knocked off by our itinerant mineralogists.

From Kilkenny we have a beautiful madrapore, called by the stone-cutters *candle-drop*. The madrapore, in its natural state, (not petrified), is in our museum; yet this beautiful marble is not wrought for sale, the owner of the common shell-marble having monopolized all the trade for chimney-pieces. The box will be forwarded to Liverpool to go by the canal to London, to your address.

I shall always be happy to execute any commands that the Society of Arts may be pleased to honor me with, and remain,

Sir,

Your most obedient humble Servant,

CHARLES VALLANCEY.

Dublin Society, Nov. 27, 1809.

To C. TAYLOR, M D. SEC.

A List of Marbles found in the different Counties of Ireland.

Antrim.

1.—White limestone, found near Moira.

2.—Found near Moira and the Canal, running in beds and courses through No. 1.

Cork.

3 and 4.—Found near Killcrea, in large quarries.

Donnegal.

5.—Found at Gibbarow, near the sea-shore, and on the top of a rock. The estate of the Earl of Conyngham.

6.—Found in a little island near the shore, on the lands known by the name of Kilkenny. The estate of the Bishop of Raphoe.

Down.

7.—Found at Moira, in a similar situation as No. 2.

Dublin.

8.—Found at Porttranie, on the sea-shore, opposite Lambay island; a vein three feet thick, running through other rocks.

9, 10, and 11.—Found at Raheny, near Dublin, in quarries.

Kilkenny.

12 and 13.—Found at Kilkenny town, near the river Nore.

14 and 15.—Found near Kilkenny town, on the estate of the Earl of Ormond.

16.—Found at Ash-grove, and near the river Suir.

17.—Found at Besborough, in great abundance, and near water-carriage.

18.—Found at Killmacou, in very large blocks, and near water-carriage.

Note.—All the Kilkenny marbles are found in very extensive quarries.

King's County.

19.—Found near Tullamore and the Grand Canal, in a large quarry.

Longford.

20 and 21.—Found at Ballymahon, on the banks of the river Shannon, and near the Royal Canal, in an inexhaustible quarry. The estate of the late Lord Oxmantown.

Limerick.

22.—A similar marble to this is found in large blocks on the banks of the river Shannon, opposite Fyan's Island, on the estate of the Earl of Conyngham.

Tipperary.

23.—Found in detached pieces at Glanboy, within eight miles of Clonmell, and near the river Suir. The estate of Sir Thomas Osborne.

24.—Found at Knockloftus, in a large quarry, near the river Suir. The estate of Lord Donoughmore.

Waterford.

25 and 26.—Found in large masses on the sea-shore, near Dungarvon. The estate of Arthur M'Guire, Esq.

27.

27.—Found on cliffs extending along the shore of the harbour of Bolton. The estate of Cornelius Bolton, Esq.

FERMANAGH.

28 and 29.—Resemble marble found near Florence-court and Lough-Erne, at an arch formed by the river, on the estate of the Earl of Inniskillen.

The THANKS *of the Society, were this Session voted to* ALEXANDER MITCHELL, *Esq. of St. Alban's-street, for his Present of various Specimens of Granite and other Minerals, which are preserved in the Society's Repository.*

DEAR SIR,

I SEND you, by the bearer, some specimens of minerals, as granites, from Aberdeenshire, and other articles, the particulars of which are given in the inclosed letter from my friend Mr. Ewens. I am sorry that I did not know the size of the specimens required by the Society when I first wrote for them; I hope however they will be thought worthy of the Society's attention.

I am, your's very truly,

A. MITCHELL.

No. 8, *St. Alban's-street, Jan* 10, 1810.

To C. TAYLOR, M. D. SEC.

Extract

Extract of a Letter, dated Aberdeen, Dec. 26, 1809, from John Ewen, Esq. to A. Mitchell, Esq. St. Alban's-street, London.

"I HAD given an order for some specimens of our country granite, before I received the favor of your last letter, and indeed they were in the progress of polishing their faces before the letter reached me. Of course the sizes are smaller than those you mention, but on another occasion I shall attend to your instructions, and procure the specimens of the size you mention; in the mean time please to accept the following:—

No.

1. A specimen of Granite, from Logie, near Inverary.
2. A ditto ditto, —— Hilton, near Aberdeen.
3. A ditto ditto, —— Skene, ditto.
4. A ditto ditto, —— Peterhead.
5. A ditto ditto, —— Rubislaw, near Aberdeen.
6. A ditto ditto, —— Lonehead, ditto.
7. A ditto ditto, —— Dancincaërn, ditto.
8. A ditto Porphyry, —— Portsoy, Banffshire.
9. A ditto ditto, —— Labradore.

"We abound here in granite, and, in the upper district of the county, beautiful specimens of the Amianthus; the Asbestos of Pliny, are in great variety. The Cairngoram, as is improperly called, from that species of crystal having been first noticed in the neighbourhood of that mountain, near the source of the Spey, is found in most of the upper districts of Aberdeenshire. I have myself one of these hexagonal prism crystals, found near the source of the Dee, which weighs one hundred and forty-eight ounces, and is, in

in its largest circumference one foot seven inches. We are deficient in marbles, for the best specimens of these are to be found in the Western Highlands, and in the Hebrides.

I got last year one specimen of the Scotch topaz from the neighbourhood of Bennachie, in the district of Garioch, as fine a yellow as I ever saw from the Brazils; the most predominating tinge however of these crystals is the brown, or brandy colour.

The SILVER MEDAL *of the Society was this Session voted to* MR. B. COOK, *of Birmingham, for his Method of producing Heat, Light, and various useful Articles, from Pit-coal. The following Communications were received from him, and Specimens of the Petroleum, Asphaltum, and other Products, and a Waiter varnished therewith, are preserved in the Society's Repository.*

SIR,

HAVING paid much attention to the procuring of gas, and other products, from pit coal, I now beg leave to lay before the Society for the Encouragement of Arts, &c. the results of some of my experiments on pit-coal, and the methods of procuring the sundry articles of which I have sent samples, and a japanned waiter varnished therewith. The quantity of clear tar which may be produced from every hundred weight of coal is about four pounds, from which a liquor, or volatile oil, may be distilled, which answers the purposes

of oil of turpentine in japanning. Every gallon of tar will produce nearly two quarts of this oil by distillation, and a residuum will be left nearly, if not quite equal, to the best asphaltum. I have sent a waiter, or hand-board, japanned with varnish made from this residuum, and the volatile oil above-mentioned. This dries sooner, and will be found to answer as well as the best oil of turpentine, a circumstance which will be of immense advantage to this country, as in the vicinity of Birmingham only, nearly ten thousand tons of pit-coal are coked or charred per week; and all the tar hitherto been lost; but by my process, I dare venture to say, that from the various coal works in this kingdom, more tar might be produced than would supply all our dock-yards, boat-builders, and other trades, with tar and pitch, besides furnishing a substitute for all the oil of turpentine and asphaltum used in the kingdom, and improving the coke so as to make iron with less charcoal.

I have sent a large specimen of the asphaltum, and three vial bottles containing as follows:—

No. 1.—A sample of the oil or spirit, being part of that which was used in making the varnish with which the waiter sent was japanned.

No. 2.—Is the same oil or spirit, a little more rectified.

No. 3.—The same, still further rectified, and of course more clear, and freer from smell; but I find that the specimen, No. 1, answers quite as well for varnish.

Tar-spirit is now about 8*s.* per gallon, and turpentine-spirit about 15*s.*, this latter has been, within the last two years, as high as 48*s.* per gallon, and the tar-spirit will answer equally as well for varnish, as you will observe by the inclosed Certificate from Mr. Le Resche, on using the coal-tar-spirit, instead of the turpentine spirit.

I requested Mr. Le Resche to use the tar-spirit just in the

the same way he would the foreign spirit, and then give the varnish to his work-people to use, without making any remark to them, which was done: he, making the varnish himself, found it mixed, and made the varnish as good in appearance as that prepared with the foreign spirit. He then gave the varnish to his work-people to use, and when they had finished their work with it, he found from their report, that it answered perfectly, and dried sooner; and when the waiter done with it was given to the polisher, it was found to polish much smoother under the hand, and take a more beautiful gloss than their former varnish, as the article now sent will shew on inspection.

I am of opinion that the production of these articles will be of great public service. Permit me to add, that the timber of ships paid with this tar is not nearly so liable to be worm-eaten as those done with common tar.

I remain, Sir,

Your humble Servant,

B. COOK.

Birmingham, Jan. 12, 1810.

To C. Taylor, M. D. Sec.

The following Certificate *was received from Mr.* Le Resche, *who prepared and applied the Varnish of the Waiter sent to the Society.*

This is to certify, that the spirit or oil, extracted from coal-tar, is every way adequate to the purpose for which it is intended, as a substitute for the foreign spirit or oil used in japanning.

Mr. Cook having desired me to make a trial of it, the tray, or waiter, accompanying this paper, was got up in my manufactory, and is a specimen in proof of its usefulness. The varnish used for that purpose I made myself, and instead of mixing it with the usual spirit or oil imported, which is now become excessively dear, I mixed it with the spirit, or oil, extracted from coal-tar; and as I can truly affirm, that far from its being a substitute inferior in properties to the spirit in general use, I esteem it far superior in several respects.

In the trial I made of it, I found it would dry quicker, and the varnish mixed with it would polish with more ease, bear a good lustre, and, in short, answer every requisite purpose of the foreign spirit. If to these be added the reasonable price at which it may be sold, I cannot but pronounce it a discovery that must eventually prove greatly advantageous to the manufacturer, as well as interesting to every lover of the arts, or admirer of talent and ingenuity.

Witness my hand, the 16th day of January, 1810,

J. S. LE RESCH, Japanner,
Church-street, Birmingham.

Reference to Mr. Cook's Apparatus for preparing Gas and other Products from Pit-Coal, Pl. 3.

A, Fig. 1, Pl. 3, is a common fire-place, a stove built with brick, having cast-iron bars to put the fire in at, and a flue that goes into a chimney; A is the cast iron pot, (which holds from twenty-five pound to one hundred pound of coal, according to the size of the premises to be lighted) which

which hangs by the bewels or ears on a hook, suspended by a chain in this stove or furnace, about three inches above the bars of the grate, and three inches distant from the sides of the stove; the fire then flames all round this pot, and as it does not rest on the burning fuel, it is the flame only that heats it, so that it does not scale, but will last for years. The smoke, &c. is carried off into a chimney. The cover *d* of the pot is made rather conical, to fit into the top of the pot close, and from the top of the cover the elbow-pipe proceeds as far as the mark *a*. The other end of the pipe with the elbow entering the water-joint is rivetted to it after; when the lid or cover of the pot is put on, the bewels or ears come over the elbow of the pipe that is on the lid, and a wedge is put between them and this elbow, to keep down the cover air-tight, and a little clay or loam may be luted in the joint, if any gas should escape round the cover of the pot. The other elbow B goes into a water-joint, formed of a tube affixed to the cover of the purifier C; and another tube, which passes through the lid of the purifier: the elbow-pipe then goes over the inner tube, and when put on, the jointing is made good by pouring water into the space between the tubes, which renders it air-tight. The gas, as the arrows shew, passes down into the purifier C, which is rather more than half full of water; the use of this water-joint is for the convenience of removing the lid *d*, to which this pipe is attached. The purifier C is a wooden trough, with a sheet-iron top, to which the tubes are soldered, and it is fastened to the trough to keep all secure and air-tight. The sheets of iron, *e*, *f*, *g*, *h*, *i*, *k*, are alternately soldered to the iron top, and fastened to the wooden bottom. Now when the trough is half filled with water, the gas passes into it at B, and as it can only find its way out again at R, it must pass through the water. The inner pipe B reaches

under the surface of the water in the trough; now when the gas is forced into the water, it would rise to the top of the purifier, and go along in a body to the end, and out at the pipe R, if the sheets of iron, *e*, *f*, *g*, *h*, *i*, and *k*, which stand across the trough with openings in them, alternately at top and bottom, did not stop it, force it to descend down into the water, and hinder it from going any way but through these apertures, purifying it all the time it is passing through the whole body of water, until it is properly washed; it then escapes through the pipe R at the end of the trough C, then passes down the pipe S, and is carried up into the reservoir or gazometer K. In the bottom of the purifier is an aperture, closed by a plug at D, to let off the ammoniacal water and tar as it is deposited, and the pipe, with the cock E at the top of the purifier, is to burn away the spare gas when not to be used.

There is a stop-cock placed in the main pipe at F, that when the reservoir is full, and gas is making, and cannot be used, the cock may be turned, and prevent any gas from passing from the reservoir, and by opening the cock E on the top of the purifier, and firing it, all the gas which is made more than is wanted for use may be burnt away. If this was not done, the gas would continue to find its way into the reservoir K, which would overflow, and produce a disagreeable smell, which this simple way of burning it away as fast as it is made when not wanted, prevents.

It may in some measure happen, that although the gas has passed through the purifier C, yet that a small portion of tar will pass along with it, and would either clog the pipe S, or accumulate in the reservoir. To avoid this, there is placed at the bottom of the pipe S at G, before it rises into the reservoir, a jar into which a pipe made, as shewn in the drawing, conducts the tar; this collects all that passes through

through the purifier; it is filled with water, over which the gas passes up into the reservoir, but the tar drains down this lead pipe and deposits itself in the jar of water. The longer this pipe S is, the better, as it serves as a refrigitory. H is a plain cask, made to any proper size, and filled with water, with a cock to draw off the water when it becomes foul. The upper vessel K is made of sheet iron, rivetted together in the manner engine-boilers are made. If it is only from five hundred to one thousand gallons in size, it will require only two cross iron bars at top, and four ribs down the sides to keep it in form, with a strong ring at top; and as there is no stress on this vessel, it will ascend and descend easily without any other support or framing, the plain sheet iron sides being rivetted to the four ribs, and it is quite open at the bottom. A strong rope runs over the pullies L L, with a weight M to balance the vessel K, and assist it in rising and falling. The pipe J is that through which the gas passes from the reservoir or gazometer, and rising through the pipe T, is conveyed to all parts to be lighted. There is also another drain-pipe at N, for after all the washing, &c. a very small portion of tar and moisture may rise into the pipes, and perhaps in time clog them, but by laying all the pipes in the first, second, and third stories on a small descent, if any tar or moisture should rise, it will drain down all the pipes from top to bottom, and be deposited in the earthen jar at N, by that means the pipes will not clog up in half a century. These jars must be sometimes removed and emptied, fresh water put in, as also the water in the vessel H must be changed, to keep it clean and sweet; and the water in the purifier C should be changed every two or three days: by these means the gas will be deprived of all its smell, at least as far as washing will effect it, and the apparatus will be clean.

The stop-cock at O is for the use of a master, if he wishes to lock up the gas in the reservoir, to prevent his workman, &c. wasting it in his absence, as also if any pipe should leak, or a cock be out of order, in any part of the premises, by turning this cock all the gas is kept in the reservoir while the pipe is repaired, or any other alteration made; it also extinguishes all the lights when turned, if any are left burning by careless workmen, nor can they be lighted until it is opened again.

The whole of this apparatus is simple, and not liable to be put out of order in such a way, but that any person may put it to rights again. All the art required to make the gas is to take off the cover of the pot, and without removing the pot to take out the coke, and fill it with fresh coal, wedge it down by putting an iron wedge between the bewels or ears and the elbow of the vessel, and if required, plaster a little clay or loam round the cover, to keep it air-tight, a fire is then made under it, and the whole is done. The boy or man who does it, must now and then look at the fire and keep it up, until the pot is hot, and the gas is made. Now in works where lights are wanted almost always, I would recommend two fire-places, and two pots, so that when one pot is burned out, the other pot may be ready to act; for this purpose the purifier must be provided with two of the water-joints B, one communicating with each pot, and the elbow-pipe of each pot must have a stop-cock, as V: now when one pot is burning, the cock in the other pipe must be stopped, that the gas may not find its way out of the purifier, and when all the gas is extracted from that pot, the cock C, leading from it, must be stopped, and the pot left to cool; while a fire is put under the other pot, its cock is opened, and a supply of gas from it is passed into the reservoir; by these means one of the pots is constantly supplying the reservoir with gas, and the lights

are

are always kept burning; one purifier is all that is necessary; the cock V must be shut when either of the covers are taken up to fill the pot again with coal; when the elbow-pipe is lifted out of the water-joint, as the cover is attached to it, a plug must be provided to fit into the water-joint pipe the moment the elbow is removed from it, or the gas will rush out of the pipe at the water-joint; but a better way would be, to lengthen the pipe of the water-joints B, and place a large cock under each of them, almost close to the top of the purifier; when one pot is burnt out by turning the cock it keeps all the gas in the purifier while the cover is removed: no plug is necessary in this method. When people are very particular, (especially when houses or accompting-houses are to be lighted), and wish all smell to be destroyed, if they are not satisfied with washing it, and still think there is a little smell left, (and very little indeed, if any, will be left), after the washing, a small trough may be added, made in the same way as the purifier, with sheets of iron across to force the gas through the pipe R communicating with it. This trough may be filled with water, with a few lumps of lime put into it, and this water and lime changed often; on the gas being forced through this lime-water, if there was any remaining smell in it, this would completely take it away, and, as has been before observed, by changing all the waters now and then, and keeping this small trough constantly supplied with clean water and lime, the gas after passing it will ascend the pipes to the lights pure.

SIR,

HAVING been from home, I was prevented from answering your obliging letter until this day.—I am much pleased that the Society have approved of my specimens produced from

from pit-coal. I also feel highly gratified and honored with their Reward. I hope to lay before you, in a short time, an account of the establishment of a work that will be of such magnitude, as will supply this part of the country with the oil or spirit, in sufficient quantity to supersede the use of turpentine, &c. in japanning; and I do hope that in time works of the same description will be established through all Staffordshire, whose products will supply the place of a great portion of the spirit used in the kingdom, while the pitch will be of sufficient quantity to form a great part of that article now used in the dock-yards.

All I want is support from the great coal companies and masters, to erect sufficient apparatus at the different works to preserve the tar at all the coke furnaces, and proper means to separate the spirit from the tar. It would be a great saving to the nation, as in every one hundred and twelve pound of coal coked, there is lost by the present mode about four pound of tar, and the cokes are not half so good as if they were coked in close vessels, to the exclusion of the atmospheric air. I need not describe the method by drawings of the manner of extracting the tar from pit-coal in close vessels, as that method is so generally known; it must be clear to every one, that it is procured by distilling the coal.

I have, as follows, described the method I use in extracting the spirit from the tar, the process of which is so simple that every one must understand it.

Fig. 2, Pl. 3, is a section of the furnaces, and one of the retorts, almost any number of which may work in a line, the same flue will do for all, only taking care, if any are not at work, to stop up the draught-hole, which communicates with the flue. These furnaces are built without bars, grates, or doors. A is the place where the fewel is put in

to

Mr. Cooke's apparatus for making gas, & other products from Pit Coal.

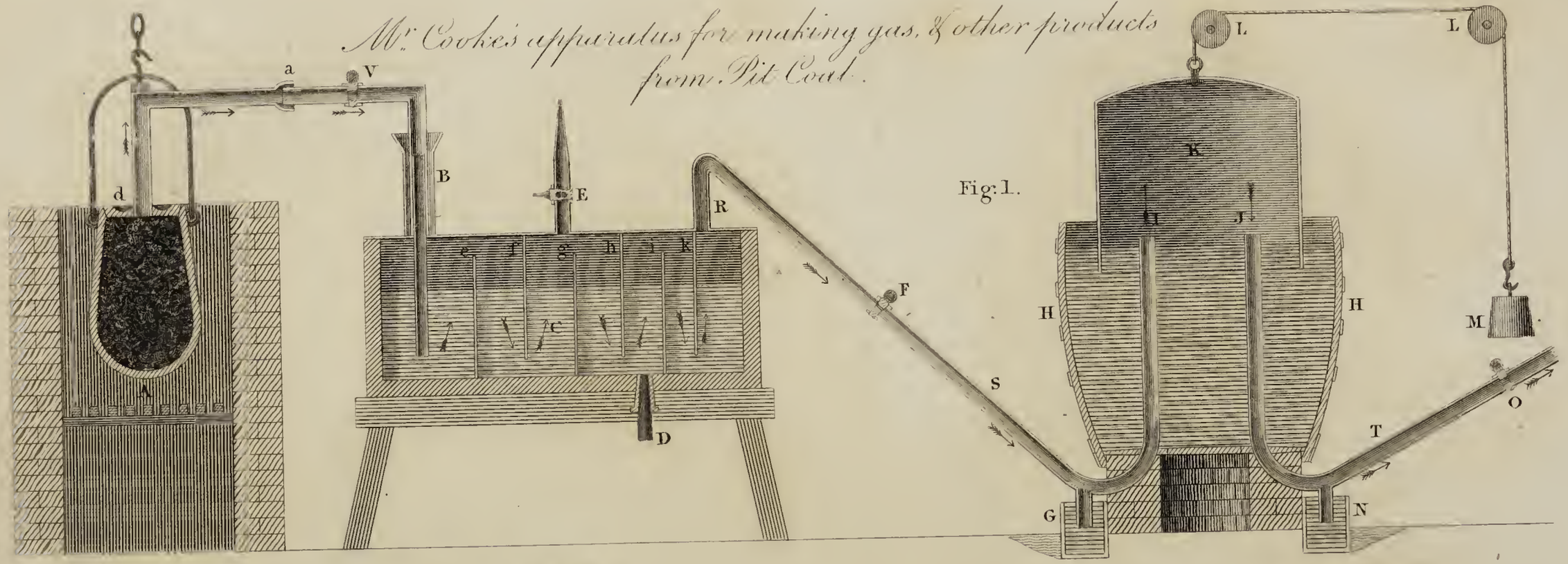


Fig: 1.

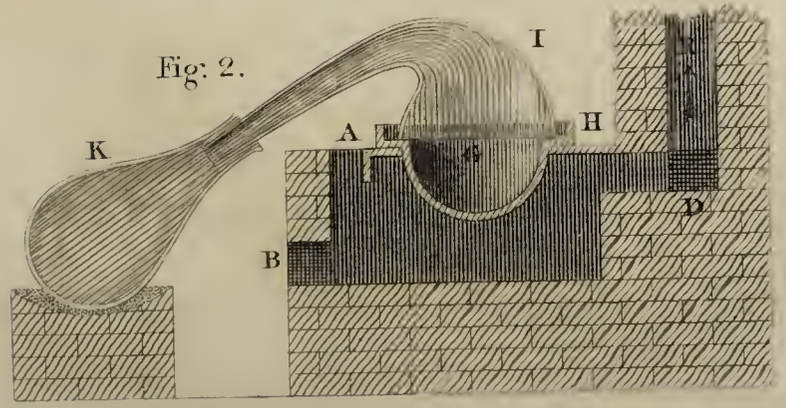


Fig: 2.

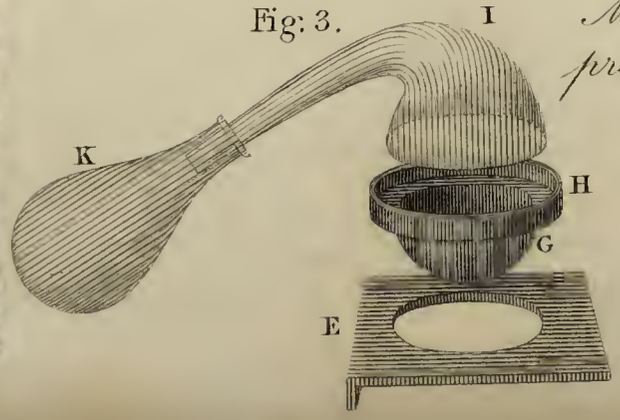


Fig: 3.

Mr. Way's method of procuring Turpentine from Fir Trees.

Fig: 4.

to heat the retort G, the fire lies under it, and the smoke is carried off into the flue F. B is the aperture where the ashes are raked out. G is a section of the iron bason, or lower part of the retort; the dark-shaded square part shows the space the fire occupies, and the black square D the flue as it runs along the back of all the line of furnaces, and enters the chimney R, as the arrows shew. I, Figs. 2 and 3, shews the upper part of the iron, earthen, or glass retort, fitted on the cast-iron bason G. K, the receiver. By this mode of setting the retorts, all the great expense of bars, doors, frames, &c. are saved, and a brisker draught of air is obtained, which may be slackened at pleasure by covering up in part, or wholly, the fire-place A with a brick. E is a square iron plate with a circular hole in the centre, built on the top of the furnace, The cast-iron bason of the retort G is made to the size of the hole in the plate: the most convenient size of the bason of the retort I find is about five or six gallons, in the shape of a deep pot, with a flanch or rim H round the edge of it; this pot or bason of the retort is put into the iron plate E, and the flanch of the retort then rests on the plate E. I is the upper part of the retort without a bottom, made to rest and fit on the flanch of the cast-iron bason G. K is the receiver, larger in the mouth than the nose of the retort. To begin the work, I fill, nearly, the iron bason of the retort G with coal-tar. I then put on the upper part of the retort I, and make it air-tight with a little sand thrown round it at the flanch H; the receiver K is put in its place, and a slow fire is put in at A, under the retort; the tar soon begins to boil slowly, or rather simmer; now as soon as that begins there rises from the tar a thick whitish vapour, which fills the glass retort, part becomes condensed, and falls

falls in drops from the sides of the retort into the tar again, while the purer spirit rises into the neck is condensed, and keeps dripping down the neck into the receiver; this is the spirit of the tar, and with this spirit that first arises from the tar was the waiter japanned which I sent you. The reason I chose to have the receiver wider at the mouth considerably than the nose of the retort is, that there is a strong and very volatile oily ammonia, that does not soon condense, but gets out of the receiver into the air the instant it leaves the retort, and though but in a very small quantity, so small that it is hardly possible to catch it; yet will it impregnate the air for a great distance round, with its very penetrating smell, while the spirit keeps dropping into the receiver pure and separate from the ammonia. The spirit is very volatile, quite as much so, if not more, than the spirit of turpentine, and soon evaporates if exposed to the air, which is a proof of its drying nature; indeed when used as a substitute for turpentine, it dries in the stove quite as soon or sooner, and takes equally as beautiful a polish. I sent you three specimens, No. 1. is what came off the tar first. No. 2. is the same distilled a second time; and the third specimen is the second re-distilled again in a glass retort: it there leaves a little pitchy residuum, and comes over clear, as the sample. Very little of the spirit is lost in passing through these different stages, if care is taken that the fire is slow and the process not hurried. When the spirit is perfectly extracted from the tar, there remains in the bason of the retort that beautiful pitch or asphaltum sent, which when mixed with the spirit, forms an ingredient for making the black varnish used in japanning. If it is wished to use it as pitch, less spirit must not be extracted from it. I find that six

gallons

gallons of tar will produce, if care is taken, about two gallons or two gallons and a half of spirit. A great number of retorts may be kept working by a single man; if we say only one hundred, and only worked down in a day, they will produce two hundred to two hundred and fifty gallons of spirit, so that by increasing the number, any quantity may be obtained. When the spirit is used in the place of turpentine, the varnish-maker uses it in the same way, and in the same quantity, as there appears no manner of difference in the use of it from spirit of turpentine in the making of varnish. When the asphaltum is used, it supplies the place of real asphaltum, and in about the same quantity. I have explained the whole as clear as I can, but if any more information is required, I should feel happy in giving it, and am,

Sir,

With great respect,

Your obedient humble Servant,

B. COOK.

Birmingham, March 13, 1810.

To C. Taylor, M. D. Sec.

*** To such persons as wish for further particulars on the subject of lighting apartments with gas, it may be proper to note that the Society, in their 26th volume of Transactions, page 202, have given an engraving and description of a gazometer, and apparatus for making carbonated hydrogen gas from pit coal, which communication was sent to them by Mr. S. Clegg, of Manchester.

The

The SILVER MEDAL *of the Society was this Session voted to Mr.* H. B. WAY, *of Bridport Harbour, for his Method of procuring Turpentine and other Products from the Scotch Fir,* (Pinus Silvestris, Linn.). *The following Communication was received from him, an Explanatory Engraving is annexed, and part of the Tree, from whence the Turpentine was extracted, along with some of the Products, are preserved in the Society's Repository.*

SIR,

THE enormous high price of turpentine, tar and pitch, last year, brought to my remembrance that I had, in 1792, when in America, made some memorandums on the subject of obtaining them in North Carolina, which, on referring to, led me to think that they might be obtained in this country. I was induced to mention it to my relation and friend, John Herbert Brown, Esq. of Weymouth, and of Sheen, in Middlesex, when on a visit at my house, and I expressed a wish that I could try the experiment with regard to turpentine, when he very kindly gave me leave to try it on three trees growing on his estate, about three or four miles from this place, and he went with me and fixed on them, and early in last April I had them prepared for the purpose of extracting the turpentine, and they have been running till the 18th instant. The weather, except the last month and part of this, has, from so much rain falling, and there being so little hot weather, been particularly unfavorable for this business, as the distance being

being such as to prevent the trees being regularly attended, the hollows were frequently found by my men full of water, and a good deal of the turpentine, which run off with the water, lay on the ground. Under all these circumstances I was only able to obtain from the three trees about two pounds and a half of turpentine. Mr. Brown being with me again the 16th and 17th instant, as he wished to take the trees down, I begged he would allow me to take a part from one of them, for the purpose of sending to the Society of Arts, Manufactures, and Commerce, with the turpentine collected from the trees, which he most readily complied with. I have therefore taken about six feet from one of them, (they were all nearly the same size); what I have sent is the part from the ground to the top of the place that has been cut away for the turpentine to run into the hollow, from whence it was to be collected; the hollow was cut in this considerably higher than is usual in America, as this tree stood in a hedge, and could not well be hollowed lower; I have matted up this part of the tree, and secured it with straw and a double matt, to prevent the bark being rubbed off, that it may be seen in the same state as it stood when the turpentine was taken from it; the turpentine is in the cask in which it was deposited when brought from the trees, and I have this day shipped both on board the sloop Betsey, Captain Trent, bound to Downe's Wharf, London, directed to you, freight paid here by me, which vessel I expect will sail in a day or two, and I hope you will receive them safe, which, when you do, you will much oblige me by requesting that both may be examined, in the hope that this small trial may meet with the approbation of the very highly respectable and truly useful Society of Arts, Manufactures, and Commerce, and if considered likely to prove useful, that they may induce some

person

person who has the means and opportunity of doing it, to make a trial on a larger scale, so as to fairly ascertain whether turpentine can be obtained in this country from the very large and numerous plantations of Scotch firs, now in the United Kingdom, previous to the trees being cut down, either to thin plantations, or where ground is designed to be cleared, as taking the turpentine from the trees previous to their being cut does not at all injure the wood, and by making the hollow in the trunk of the tree about six inches from the ground, it would waste but a very small quantity of timber. I have taken the liberty of annexing a copy of memorandums I made when in North Carolina, respecting the modes of collecting turpentine, and making tar and pitch, in hopes they may afford the Society some little information, as they are not, I apprehend, very generally known. They are copied from memorandums which I actually made on the spot. I would have sent the memorandum-books with this, had not the remarks been mingled with others relative to my commercial pursuits, but I shall have no hesitation in allowing any person to examine them, or to afford any information in my power to any persons willing to make experiments in this way, if they will favor me with a call. I am well satisfied in my own mind, that very large quantities of tar might be obtained from the knots and limbs of the Scotch fir when cut down, and that the charcoal made from it would not be injured by the tar being first extracted; and as I was in Norway, Sweden, and Russia, in 1789 and 1790, and saw no tree from which I consider that tar could be extracted, except the Scotch fir, or red deal, which is one and the same tree, I am persuaded that the refuse of that tree must be what they make the tar from in those countries, though I had no opportunity of seeing the process there. I suspect that the

Swedish

Swedish tar-kilns must be constructed of brick, or some sort of masonry, as the tar from thence is much clearer, better, and more free from extraneous matters than that of any other country. I have observed the tar from North Carolina to have frequently a quantity of sand in it, which is easily accounted for, from the soil in which the kilns are made; it would, in the careless way in which they take it out of the hole dug in a sandy soil, be very likely to be mixed with the sand. In the small cask, in which the turpentine is, I have sent a few small red deal knots from some timber that I have lately taken out of my warehouse, on some alterations being made; the timber from which they are taken has been in the warehouse ever since the summer of 1786, and yet when these pieces are exposed to a moderate heat, the tar will be seen to exude from them.

I remain, Sir,

Your obedient and very humble Servant,

H. B. WAY.

Bridport Harbour, Nov. 27, 1809.

To C. Taylor, M. D. Sec.

Extracts from Notes taken by Mr. Way.

Thursday, April 12, 1792.

Arrived at Wilmington, North Carolina, about one P. M. Observed on the roads the pitch-pines prepared for extracting turpentine, which is done by cutting a hollow in the tree about six inches from the ground, and then taking the bark off from a space of about eighteen inches above it, from the sappy wood. The turpentine runs from April to October, and is caught by the hollow below. Some of the

trees were cut on two sides, and only a strip of the bark left of about four inches in breadth on each of the other two sides, for conveyance of the sap necessary for the support of the tree. A Captain Cook, with whom I had been travelling, informed me that some trees would run six or seven years, and that every year the bark was cut away higher and higher, till the tree would run no longer, and I observed many that had done running, and they were in general stripped of the bark on two sides, as high as a man could reach, and some were dead from the operation; others did not look much the worse for it. I find the usual task is for one man to attend three thousand trees, which taken together would produce one hundred to one hundred and ten barrels of turpentine.

April 15, 1792.

On my return from Wilmington to Cowen's tavern, distant about sixteen miles from thence, I was informed that the master of the house had been a superintendant of negroes, who collected turpentine. I found the information I had before received was not perfectly correct; he told me he attended to six slaves for a year for a planter, and between the 1st of April and the 1st of September they made six hundred barrels of turpentine. The cutting the trees for the purpose of collecting is called boxing them, and it is reckoned a good day's work to box sixty in a day; the trees will not run longer than four years, and it is necessary to take off a thin piece of the wood about once a week, and also as often as it rains, as that stops the trees running. While in North Carolina, I was particular in my inquiries respecting the making tar and pitch, and I saw several tar-kilns; they have two sorts of wood that they make it from, both of which are the pitch-pine; the sort from which most of it is made are old trees which have fallen down in the woods,

and

and the sap rotted off, and is what they call light-wood, not from the weight of it, as it is very heavy, but from its combustible nature, as it will light with a candle, and a piece of it thrown into the fire will give light enough to read and write by; all the pitch-pine will not become light-wood; the people concerned in making tar know it from the appearance of the turpentine in the grain of the wood, the other sort of wood which is used, after the trees which have been boxed for turpentine, have done running, they split off the faces over which the turpentine has run, and of this wood is made what is called green-tar, being made from green-wood instead of dry. When a sufficient quantity of wood is got together, the first step is to fix a stake in the ground, to which they fasten a string, and from the stake, as a centre, they describe a circle on the ground according to the size they wish to have the kiln; they consider that one, twenty feet in diameter and fourteen feet high, should produce them two hundred barrels of tar; they then dig out all the earth a spit deep, shelving inwards within the circle, and sloping to the centre; the earth taken out is thrown up in a bank about one foot and half high round the edge of the circle; they next get a pine that will split strait, of a sufficient length to reach from the centre of the circle someway beyond the bank; this pine is split through the middle, and both parts are then hollowed out, after which they are put together, and sunk in such a way, that one end, which is placed in the centre of the circle is higher than that end which comes without the bank, where a hole is dug in the ground for the tar to run into, and whence the tar is taken up and barrelled as it runs from the kiln. After the kiln is marked out, they bring the wood, ready split up, in small billets, rather smaller than are generally used for the fires in England, and it is

then packed as close as possible, with the end inwards, sloping towards the middle, and the middle is filled up with small wood and the knots of trees, which last have more tar in them than any other part of the wood; the kiln is built in such a way, that at twelve or fourteen feet high it will overhang two or three feet, and it appears quite compact and solid. After the whole of the wood is piled on, they get a parcel of small logs, and then place a line of turf, then another line of logs, and so on alternately all the way up, and the top they cover with two or three thicknesses of turf. After the whole is covered in this way, they take out a turf in ten or a dozen different places round the top, at each of which they light it, and it then burns downwards till the whole of the tar is melted out; and if it burns too fast they stop some of the holes, and if not fast enough they open others, all of which the tar-burner, from practice, is able to judge of. When it begins to run slow, if it is near where charcoal is wanted, they fill up all the holes, and watch it to prevent the fire breaking out any where till the whole is charred; the charcoal is worth two-pence to three-pence, British sterling, per bushel. It will take six or eight days to burn a tar-kiln; in some places they burn it at such a distance from the shipping that they have very far to roll it, and even then sell it at from 3*s*. 6*d*. to 5*s*. British sterling, per barrel, sometimes taking the whole out in goods, but never less than half the amount in goods, from all which it will be reasonably supposed that tar-burning in that country is but a bad trade, as it must be a good hand to make more than at the rate of a barrel a day; the barrels cost the burner about 1*s*. 3*d*. British sterling, each; the tar-makers are in general very poor, except here and there one that has an opportunity of making it near the water-side. Pitch is made by either boiling the tar till it comes to a proper thickness,

thickness, or else by burning it; the latter is done by digging a hole in the ground, and lining it with brick, it is then filled with tar, and they set fire to it, and allow it to burn till they judge it has burnt enough, which is known by dipping a stick into it, and letting it cool; when burnt enough they put a cover over it, which stops it close, and puts out the fire. Five barrels of green tar will make two of pitch; and it will take two barrels of other tar to make one of pitch.

N. B.—The foregoing observations respecting tar and pitch, are copied from a memorandum made by me at Suffolk, in Virginia, on the borders of North Carolina, April 23, 1792, and are the result of the inquiries and observations I made on the subject whilst in Carolina.

Wilmington, N. C. April 13, 1792.

In conversation with a Mr. Hogg, who had been settled there, and at Fayette-ville before the War, I learnt that pitch-pine timber growing on the sands was the best, and that it was reckoned to be better if cut in the winter before the sap rises in the tree.

H. B. WAY.

SIR,

It affords me much pleasure to learn that my communication, on the extraction of turpentine from the Scotch fir, has been thought worthy of the consideration of the Society, and it will be highly gratifying to me, if it should induce persons who have considerable plantations to try it on such a

scale as to ascertain to what extent it might prove beneficial in this country. The experiment should be tried on trees so situated as to be conveniently examined every day, and the turpentine collected in the hollows removed as often as possible to prevent its being injured, or wasted by the rain. I think, that during the American war, some importations of turpentine were made from Russia and Sweden, and if so, it must have been extracted from what we call the Scotch fir in a colder climate than this. The article called Venice turpentine, which is brought from Carinthia and Carniola, is extracted there from the larch tree; and it might probably answer to try to produce it from the larch trees grown in Great Britain, in the same way as I have collected the turpentine from the Scotch fir. Respecting the wood of the Scotch fir being injured, by the extraction of the turpentine from it, I should rather think that it would, on the contrary, be the better for it; as all those who use deals from Scotch fir, in this neighbourhood, complain that it is too full of turpentine to work well. The fact might be ascertained, by the piece of timber which I sent to the Society, as if it was wished to preserve that part in which the hollow is made, the back part, or nearly half of the tree might be sawn into boards without injury, and those boards might be compared with some from a tree taken down in the winter, from whence the turpentine has not been extracted; it must however be noted, that from the tree I have sent to the Society, the turpentine has only been running one year, whereas, in America, they collect the turpentine from the same tree for three or four succeeding years. It has been supposed and asserted that turpentine was only obtainable from the United States; but I have sufficient documents to prove, if required, that a very large quantity of it can be procured from East Florida; and, I well remember, that

about

about the year 1782, several cargoes of turpentine were shipped in the River St. John's, for Britain; and though that country is at present in the hands of the Spaniards, no doubt, arrangements might be made with the Spanish Government for a supply of that necessary article from thence. It is my earnest wish, that through the medium of the Society of Arts, I may render any information that may be serviceable to the interest of the united Empire, and I will, with pleasure, furnish further communication on the products of Florida and its commerce, if desired by the Society.

I am convinced that tar might be produced from the refuse of firs of English growth to advantage, and that a much better article could be made from them in Britain, that any imported from America. The Scotch firs, in England, from being planted at greater distances from each other than they are naturally found abroad, have much larger knots, and greater numbers of them than in Carolina, or the North of Europe, and would therefore produce more tar, in proportion, from their refuse wood than the trees of those countries.

The pitch-pine of Virginia, the Carolinas, Georgia, and the Floridas, grow to an immense size in what are there called pine-barrens, the soil, of which is finer and whiter than the sand used as writing-sand in Great Britain, and the trees grow almost to the verge of high-water mark on the sea shores. I think it would answer a good purpose for the Society to encourage, by premiums, the extraction of turpentine from British firs.

I remain, Sir,

Your obedient, and very humble Servant,

Bridport Harbour, April 21, 1810. H. B. WAY.

To C. Taylor, M. D. Sec.

J. H. Browne, Esq. of Weymouth, certified that he had witnessed the principal experiments made by Mr. Way, in extracting the turpentine from the Scotch firs. That the trees had been planted in 1771 or 1772, and that the wood, subsequent to the operation, had been minutely examined, and found not to be injured by the extraction of the turpentine. He added, that the season was uncommonly wet and unfavorable for the experiment.

Reference to the Description of Mr. H. B. Way's Method of procuring Turpentine from Fir Trees. Pl. 3, Fig. 4.

a, Represents the lower part of a fir tree, as growing in the earth; *b*, shows the part where a portion of the bark is taken off to assist the emission of the turpentine; *c*, is a hollow cut within the body of the tree, it is in the form of a bason at the lower part to receive the turpentine, which exsudes into it from the pores of the tree: this bason is about six inches from the ground.

PAPERS

IN

POLITE ARTS.

The SILVER MEDAL *and* THIRTY GUINEAS *were this Session voted to Mr.* J. HASSELL, *No.* 11, *Clements Inn, for his Improvement in the Aquatinta Process, by which Pen, Pencil, and Chalk Drawings can be imitated. The following Communication was received from him. An Etching executed on a Copper-plate, various Impressions and Specimnes of the Work, and Samples of the Varnishes and other Articles, are preserved in the Society's Repository.*

SIR,

PERCEIVING the various methods of imitating drawings and sketches in the graphic art fall short of an accurate imitation of the black-lead pencil, I determined on an attempt, some years since, which, after repeated experiments, I flatter myself I have fully established.

The manner is totally new, and solely my own invention :— by the method I adopt any artist can sketch with a black-lead

lead pencil his subject immediately on the copper, and so simple and easy is its stile, that an artist can do it with five minutes study.

By this manner, the trouble in tracing on oil paper, and other re-tracing on the etching ground is avoided, and the doubtful handling of an etching-needle is done away, as the pencilling on the copper is visible in the smallest touch :— It has also another perfection, that by using a broader instrument it will represent black chalk, a specimen of which I procured Mr. Munn, the landscape painter, to make a trial of. I have, herewith, sent the said specimen marked C, and Mr. Munn's name is affixed to the same. This subject he actually drew upon copper, under my inspection, in less than twenty minutes, the time he would have taken, perhaps, to do the same on paper; in fact, it can be as rapidly executed on copper as on paper.

It is particularly pleasant for colouring up, to imitate drawings, as the lines are soft, and blend in with the colour. It is a circumstance always objectionable in the common method of etching, that those so tinted can never be sufficiently drowned, nor destroyed, and always present a wiry hard effect.

It is equally adapted to historical sketching, and might be the means of inducing many of our eminent painters to hand down to posterity their sketches, which, at present, they decline from the irksome trouble attending the repetition of retracing their performances, and the doubtful handling of the etching-needle, which can never give a sufficient breadth and scope to their abilities.

I have, Sir, forwarded, in an annexed paper, the different specimens, for the inspection of the Gentlemen forming the Society of Arts, &c. &c.

In making my specimens I have thought it necessary to shew, that if by any accident a part might fail, that it could be

be re-touched a second time, and oftener if wanted; in this particular its simplicity stamps its use.

To elucidate the foregoing preposition, I purposely caused a part of the distance to fail in specimen A A; this is repaired you will perceive in specimen B, and the sharp touches wanted to perfect the sketch are added.

I beg also to state, it is not the stile usually termed *soft ground etching*: that process is always uncertain, cannot be repaired, and will only print about two hundred impressions; whereas the specimens herewith sent will print upwards of five hundred with care.

Should the Society for the Encouragement of Arts, &c. deem the subject worthy of their reward, I shall feel proud in communicating its process, and flatter myself the arts and artists will feel a peculiar addition and pleasure in its utility.

Permit me, Sir,

to subscribe myself, with all respect,

Your obedient humble Servant,

JOHN HASSELL,

Landscape-Draftsman, 11, Clement's Inn, Strand.

March 26, 1810.

To C. TAYLOR, M. D. SEC.

&c. &c. &c.

Process of drawing upon Copper, to imitate Black-lead Pencil or Chalk.

A remarkable good polish must be put on the copper with an oil-rubber and crocus-martus well ground in oil; after

after which it must be cleaned off with whiting, and then rubbed with another clean rag.

You are then to pour over your plate the solution to cause ground, which is made as follows :—

No. 1.—Three ounces of Burgundy pitch.
One ditto of frankincense.

These are to be dissolved in a quart of the best rectified spirits of wine, of the strength to fire gunpowder when the spirits are lighted.

During the course of twenty-four hours this composition must be repeatedly shook, until the whole appears dissolved; then filter it through blotting paper, and it will be fit to use.

In pouring on this ground, an inclination must be given to the plate that the superfluous part of the composition may run off at the opposite side, then place a piece of blotting-paper along this extremity, that it may suck up the ground that will drain from the plate, and in the course of a quarter of an hour the spirit will evaporate, and leave a perfect ground that will cover the surface of the copper, hard and dry enough to proceed with.

With an exceeding soft black-lead pencil sketch your design on this ground, and when finished take a pen and draw with the following composition, resembling ink: if you wish your outline to be thin and delicate, cause the pen you draw with to be made with a sharp point; if you intend to represent chalk-drawing, a very soft nib and broad-made pen will be necessary, or a small reed.

No. 2.—Composition, resembling ink, to draw the design on the copper.

Take about one ounce of treacle or sugar-candy, add to this three burnt corks reduced by the fire to almost an impalpable powder, then add a small quantity of lamp-black

to

to colour it; to these put some weak gum-water, (made of gum-arabic), and grind the whole together on a stone with a muller: keep reducing this ink with gum-water until it flows with ease from the pen or reed.

To make the ink discharge freely from the pen, it must be scraped rather thin towards the end of the nib, on the back part of the quill, and if the liquid is thick reduce it with hot water.

Having made the drawing on the copper with this composition, you will dry it at the fire until it becomes hard; then varnish the plate all over with turpentine-varnish (No. 3,) of the consistency of the liquid varnish sent with this as a sample.

It will now be necessary to let the varnish that is passed over the plate, dry, which will take three or four hours at least; but this will depend on the state of the weather; for if it should be intensely hot, it ought to be left all night to harden.

Now the varnish is presumed to be sufficiently hard, you may rub off the touches made with the foregoing described ink with spittle, and use your finger to rub them up; should it not come off very freely, put your walling-wax round the margin of your plate, and then pour on the touches some warm water, but care must be taken it is not too hot.

The touches now being clean taken off, wash the plate well and clean from all impurities and sediment of the ink, with cold *soft* water, then dry the plate at a distance from the fire, or else in the sun, and when dry, pour on your aquafortis, which should be in cold weather as follows:—

To one pint of nitrous acid, or strong aquafortis, add two parts, or twice its quantity of soft water.

In hot weather to one part of nitrous acid add three parts of water.

In

In every part of this process avoid hard or pump water.

The last process of biting in with aquafortis must be closely attended to, brushing off all the bubbles that arise from the action of the aquafortis on the copper.

In summer time it will take about twenty minutes to get a sufficient colour: in winter perhaps half an hour, or more. All this must depend on the state of the atmosphere and temperature of your room. If any parts require to be stopt out, do the same with turpentine-varnish and lamp-black, and with a camel-hair brush pass over those parts you consider of sufficient depth; distances and objects receding from the sight of course ought not to be so deep as your fore-grounds; accordingly you will obliterate them with the foregoing varnish, and then let it dry, when you will apply the aquafortis a second time, and repeat this just as often as you wish to procure different degrees of colour.

Every time you take off the aquafortis the plate must be washed twice with soft water, and then set to dry as before.

To ascertain the depth of your work, you should rub a small part with a piece of rag dipped in turpentine, and then apply the finger, or a piece of rag rubbed on the oil-rubber, to the place so cleared, and it will give you some idea of the depth.

The walling-wax is taken off by applying a piece of lighted paper to the back of the plate, all round the opposite parts of the margin where the wax is placed, then let the plate cool, and the whole of the grounds, &c. will easily come off by washing the plate with oil of turpentine, which must be used by passing a rag backwards and forwards, until the whole dissolves, it is then to be cleaned off by rags; and care must be taken that no part of the turpentine is left hanging about the plate.

The plate should only pass once through the press.

Directions

Directions respecting Grounds.

No. 1.—The ground in hot weather must have an additional one-third of spirits of wine added to it for coarse grounds, to represent chalk; and one-half added to it for fine grounds, to represent black-lead pencil; and always to be kept in a cold place in summer, and a moderate warm situation in winter.

N. B.—If any parts are not bit strong enough, the same process is to be repeated.

SIR,

DURING the conference of the Committee of Polite Arts last Monday evening, an Essay on the Art of Aquatinting was produced, which, until that period, I had never seen; since then, I have procured a copy, and carefully perused it. As far as theory goes, respecting aquatinta, I allow it to be fair; but upon the practical part it is positively wrong, and what relates according to the opinion of your Committee as referring to my invention of the imitation of chalk and pencil-drawing, I can prove, by incontestible evidence, that I did produce specimens of my invention as far back as the year 1795 to the public, since which time I have improved the principle.

I flatter myself your goodness will enforce on the minds of those gentlemen who were present that I ought personally to prove the same, which I am prepared with documents to do.

Permit

Permit me, Sir, to remark, after a lapse of fifteen years, that surely some person might have produced figures and landscapes sketched in this manner; but not a single artist, to my knowledge ever gave one specimen to the public except myself, though my examples have been before them all the above time.

It is upon the application of the manner for freedom of imitating drawings, that I conceive it to be of importance, and from this circumstance in pointing out its utility, I claim a credit from its originality. If, Sir, it was previously known, why was it not in use? The fact appears to me, that no person, except myself, thought of taking the pains to study the subject.

Having thus brought it publicly to notice, I still feel a degree of pride in furnishing an additional and easy step to the promotion of the arts.

I have now, Sir, to apologize to you for trespassing on your patience, and as it is not possible for any gentleman to have taken more trouble, or have paid a more polite attention to the circumstance, I thought it most decorous to submit this memorial to you, as one of the Chairmen of the Committee of Polite Arts.

Trusting, Sir, you will be so good as to communicate the same to the Committee, I beg to subscribe myself, with all respect,

Sir,

Your very obedient humble Servant,

J. HASSELL.

No. 11, *Clement's-inn, May* 10, 1810.

To J. T. BARBER, Esq.

A Chairman of the Committee of Polite Arts.

Inclosed

Inclosed is the description of the experiments of varnish, tracing, and gum-water, as requested by the Committee, specimens of which I have sent.

GUM-WATER must be made in the proportion of half an ounce of gum-arabic to a quarter of a pint of water.

TURPENTINE-VARNISH is composed of an ounce of black rosin to an eighth part of a pint of spirits of turpentine; if the weather is excessive warm, it ought to be made with a sixth part of a pint of spirits of turpentine.

TRACING-RAG should be made of a piece of Irish linen, not too much worn, the surface of which is to be rubbed with another rag dipped in sweet oil, just sufficient to retain a small portion of vermillion or pounded red chalk. This must be placed with the coloured part towards the ground of the plate, and the drawing or tracing laid upon it, which must be traced very lightly with a blunt point or needle.

TEN GUINEAS *were this Session voted to Mr.* RICHARD CATHERY, *No.* 14, *Mead's-row, Westminster-road, near the Asylum, Lambeth, for his Method of preparing Ox-Gall in a concentrated state for Painters, and for other Uses. The following Communications were received from him, and Specimens of the Articles are preserved in the Society's Repository.*

SIR,

IT has been long a desideratum to find out a method of preparing ox-gall for the use of painters, so as to avoid the disagreeable smell which it contracts by keeping in a liquid state, and at the same time to preserve its useful properties. I have invented a method of doing it with very little expense, which will be to those who use gall a great saving, as it will prevent it from putrifying, or breeding maggots.

One gall prepared in my method will serve an artist a long time, as it will keep a great number of years. It will be a convenient article for use, as a small cup of it may be placed in the same box which contains other colors, where it will be always ready. The qualities of gall are well known to artists in water-colors, particularly to those who color prints, as many colors will not, without gall, work free on such paper, on account of the oil that is used in the printing-ink.

The artists who make drawings in water-colors also use gall in the water which they mix their color with, as it clears away that greasiness which arises from moist hands upon

upon paper, and makes the color to work clear and bright. My preparation is ready for use in a few minutes, all that is necessary being to dissolve about the size of a pea of it in a table-spoonful of water.

It is also of great use to housekeepers, sailors, and others, to clean woollen clothes from grease, tar, &c. and will be found advantageous for many other purposes.

If it should meet with the approbation of the Society, I have no objection to prepare it for sale.

I am, Sir,

Your obedient Servant,

RICHARD CATHERY,
Botanical-Colorer.

To C. Taylor, M. D. Sec.

Process for preparing Ox-Gall in a concentrated state, by Mr. Cathery.

Take a gall fresh from the ox and put it in a bason, let it stand all night to settle, then pour it off from the sediment into a clean earthen mug, and set it in a saucepan of boiling water over the fire, taking care that none of the water gets into the mug. Let it boil till it is quite thick, then take it out and spread it on a plate or dish, and set it before the fire to evaporate; and when as dry as you can get it, put it into small pots, and tie papers over their tops to keep the dust from it, and it will be good for years.

CERTIFICATES were received from Mr. GABRIEL BAYFIELD, No. 9, Park-place, Walworth; and Mr. WILLIAM EDWARDS, No. 9, Poplar-row; both botanical colorers; stating, that they have used the ox-gall prepared by Mr. Cathery, and find it to answer better than gall in a liquid state; that this preparation is free from disagreeable smell, and is much cheaper, as one ox-gall thus prepared will last one person for two years, and be as fresh as if just taken from the ox.

A CERTIFICATE was received from Mr. JAMES STEWART, No 26, St. Martin's-street, Leicester-square, stating, that he lately belonged to his Majesty's ship the Vestal frigate, and that he took out with him, in a voyage to Newfoundland, a large pot of the prepared ox-gall, for the purpose of washing his greasy clothes for two years; that he found it very serviceable, and to keep its virtue as well as the first day.

PAPERS

IN

MANUFACTURES.

The SILVER MEDAL *of the Society was this Session voted to Mr.* EDWARD SMITH, *of Brentwood, Essex, for Manufacturing from the Fibres of the common Nettle, Thread, and Articles resembling Flax, Hemp, Tow, and Cotton. The following Communications were received from him, and Specimens of the various Articles are preserved in the Society's Repository.*

SIR,

I HAVE the honor to transmit to you a short memoir on that hitherto much-neglected and despised vegetable the nettle, with the general useful purposes to which the produce thereof may be applied. If you think it will merit any claim to the attention of the Society, I request you will do me the favor to lay it before them.

My attention was first directed to this matter about the year 1793, but from many impediments no favorable opportunity presented itself for particular investigations till about the year 1800, since which time, I have annually selected a few of the nettle plants from their various situations at different periods, in order to ascertain the state most congenial to the process, and that most suitable to the different purposes to which I thought them applicable. The result of my experiments has deeply impressed upon my mind, that they may be made subservient to national utility, particularly at the present period, when our foreign commerce is so generally impeded, and in consequence our supplies of foreign hemp and flax nearly annihilated.

I beg leave to observe that the growth of nettles is general, in every country, particularly in strong fertile soils, that on every bank, ditch, and place, which cannot be brought to tillage, they are produced in such abundance, that the quantity, if collected, would be of great magnitude.

The growth of them might be encouraged in such waste places, or a vast quantity of land of that description might, at a moderate expense, be made to produce a valuable crop of a useful article heretofore regarded as a nuisance. The shady places in woods, parks and coppices, are particularly favorable to their growth; I have found them in such situations in the greatest perfection in point of length and fibre. The harl, or fibre of them, is very similar to that of hemp or flax, inclining to either according to the soil and different situations in which they grow: I have ascertained as far as I have been able to proceed, that they may be substituted for every purpose for which hemp

or

or flax is used, from cloth of the finest texture down to the coarsest quality, such as sail-cloth, sacking, &c. and for cordage.

Another most material use, the magnitude of which, I trust will be duly estimated, is, that they may be applied to the manufactory of paper of various qualities. The impediments in foreign commerce has lately deprived us of a supply of linen rags, and occasioned a general use of cotton rags in the paper manufactory, which is injurious to the preservation of the most valuable works in literature, to the truth of which the observation of every one must bear testimony who has attended to the depreciated quality of writing and printing papers.

That the produce of nettles and the refuse of them from the manufactory, may easily be converted into writing, printing, and all inferior sorts of paper, I feel confidently assured. For the purpose of writing and printing paper they might be gathered twice in one season, as for those uses the length of staple is not required, and the fibre would be considerably increased in its fineness, and in point of colour either in the refuse or unwrought state, the chemical process of bleaching now in practice would render them a delicate white.

I have in possession some samples which have gone through a succession of processes similar to what are practised on hemp and flax, and I have without the aid of any implements brought them to a state of preparation ready for the hackle; but for want of that, and their being no flax or hemp manufactory in this neighbourhood, I have not been able to proceed further, but I judge that they are sufficiently advanced so as amply to evince the practicability above referred to.

If you think proper, I will transmit the samples for the Society's inspection, and give any further information in my power.

Permit me the honor to subscribe myself, Sir,

Your most humble Servant,

EDWARD SMITH.

Brentwood, Essex, March 24, 1809.

To C. Taylor, M. D. Sec.

SIR,

I am much obliged to the Society for their reference of my communication to one of their Committees. About ten years subsequent to my first observations, and three to my first experiments, I observed the following paragraph in the Chelmsford Chronicle, November 25, 1803. "The Society of Œconomy, at Haërlem, has offered prizes for the best memoir as to the particular species, the season for gathering, and the menipulation necessary in preparing nettles for use." This is the only account I have ever seen of them, and shows that such a matter was regarded as deserving the attention of that Society; but as I from the first had it in contemplation to present my observations on the subject to the Society of Arts, &c. and thinking the matter of great consequence, and wishing my own country to be benefitted by it, I declined answering the Haërlem advertisement.

My discovery of the properties of the nettle is original, and

and arose entirely from my own observations on the apparent to hemp and flax, which I remarked they had when growing. I now transmit to you some samples, in different states, for the Society's inspection.

I have the honor to be, with great respect, Sir,

Your most humble Servant,

EDWARD SMITH.

Brentwood, March 28, 1809.

To C. Taylor, M. D. Sec.

SIR,

I have now the honor to transmit to the Society my further progress, viz. A sample of yarn which was prepared from the coarsest part of the nettle-produce, which I deemed less liable to be injured for want of knowledge in the manufacturing than the finer qualities. Since my former letters I have been bleaching some of the nettle-flax, and have brought it to so good a colour, that a preparation from it would produce paper perfectly white, and I have caused a sample of yarn to be made from the nettle-produce, both of which I have sent.

I likewise inclose an improved specimen of paper made from the same substance, also a preparation for paper, a part of the same sample the inclosed was made from, which is, of course, much inferior to what would be done by a paper-manufacturer; these samples having been made by such

such rough instruments as were constructed by my own hands, and which of course the Society will consider.

I remain respectfully, Sir,

Your obliged humble Servant,

EDWARD SMITH.

Brentwood, Nov. 18, 1809.

To C. Taylor, M. D. Sec.

The following Specimens, produced from Nettles by Mr. Smith, are deposited in the Housekeeper's Office.

Samples of the fibres, in their rough state, resembling different kinds of hemp and flax.

Samples of their fibres equal to the finest flax, and remarkably strong in texture.

Samples of very strong yarn, prepared from the coarsest fibres.

Samples of coarse paper, prepared from the rough refuse fibres.

Samples of the coarse fibres bleached white.

Samples of a substance resembling cotton prepared from the bleached coarse fibres.

Samples of white paper prepared by him from the last-mentioned substance.

Mr.

Mr. Smith's Process for preparing various Articles from Nettles.

The kind of nettle capable of being manufactured into cloth, &c. it is scarcely necessary to say, is that which in general is denominated the stinging-nettle. The most valuable sort, which many years practical experience has furnished me with a knowledge of, in regard to length, suppleness, fineness of the lint, brittleness of the reed, which dresses most freely, with less waste of fibre, and yields the greatest produce of long and fine strong harl, I have found growing in the bottom of ditches amongst briars, and in shaded valleys, where the soil has been a blue clay or strong loam, but from which situations I have selected some which have measured more than twelve feet in height, and upwards of two inches in circumference. Plants growing in the situations above described are in general from five to nine feet in height, and those growing in patches on a good soil, standing thick, and in a favorable aspect, will average in height about five feet and a half, will work kindly, and the stems are thickly clothed with lint. Those which grow in poorer soils, and in less favorable situations, with rough and woody stems, and have many lateral branches, run much to seed, are stubborn, and work less kindly; they produce lint more coarse, harsh and thin. In every situation and different soil I have experienced the most productive nettles to be those which have the smoothest and most concave tubes, the largest joints, the fewest leaves, and which produces the least quantity of seed.

In gathering them, as they are perennial plants, I have preferred the mode of cutting them down, instead of pulling them up by the roots, which I recommend to be the practice,

tice, with a view to obtain a second crop where the situations will allow of it, and to secure the propagation of them the subsequent year.

The most favorable time for collecting them is from the beginning of July to the end of August, but it may be continued even to the end of October, only the lint of those which remain growing to that time will be less supple, and will not work so freely; and if the season happens to be unfavourable, it is probable there would not be sufficient time to steep and grass them, in which case they should be dried by the heat of the atmosphere, or if the state of the weather would not permit of that, then by means of artificial heat; and when dried they should be housed or stacked till the spring, when they might successfully undergo the same operation of steeping as those of the first collection. Such as grow in grass fields, where the grass is intended for hay, should be cut when the hay is cut, in order to prevent their being spoiled by the cattle when feeding; the harles of which would be fine in quality, and well suited to be wrought up with the second crop, and which crop may be obtained after those of the first cutting, where the situation will admit of their being preserved, the fine quality of such I ascertained last autumn, and found the height of them to average three feet and a half; they were gathered the latter end of November. The following are the processes adopted by me.

After the nettles are gathered they should be exposed to the atmosphere till they gain some firmness, in order to prevent the skin being damaged in the operations of dressing-off the leaves, the lateral branches and seeds, which should be done a handful at a time, and afterwards sorted, viz. those which are both long and fine by themselves, those which are both long and coarse by themselves, and those

which

which are short and coarse by themselves; then made up into bundles as large as can be grasped with both hands, a convenient size for putting them into the water, and taking them out, a place for that purpose being previously prepared, either a pond or a pit free from mud, or a brook or river. The bundles should then be immersed and placed aslant with the root end uppermost, and to prevent their floating on the surface some weight should be laid upon them.

The time required for steeping them is from five to eight days; but it is better they should remain rather too long in the water than too short a time, yet great care should be taken they are not over-done: when the fibre approaches to a pulp, and will easily separate from the reed, and the reed becomes brittle and assumes a white appearance, that operation is finished.

The bundles should then be taken out singly, very carefully, to avoid damaging the fibres, and be rinsed as they are taken out of the water to cleanse them from the filth they may have contracted; they must then be strewed very thin upon the grass, and be gently handled. When the surface of them is become sufficiently dry, and the harl has obtained a degree of firmness, they should be turned repeatedly till they are sufficiently grassed; the time required is known only by experience, so much depends on the state of the weather during the process; when they are sufficiently done, the hard blisters and the stems become brittle; they must then be taken up and made into bundles, and secured from the weather.

The harl is now to be separated from the reed, after the manner practised on flax and hemp, either by manual labor or machinery now in use in those manufactories. That operation

ration was performed in my experiments by hand, and with implements constructed by myself, but which I consider too simple here to describe.

The harl being separated from the reed it requires next to be beaten, that it may become more ductile for the operation of dressing, and which may be performed with such implements as are used for dressing flax or hemp.

This operation being accomplished, the produce of the nettles is arrived at a state ready for spinning, and may be spun into various qualities of yarn, either by hand, or by machinery constructed for the purposes of spinning flax or hemp, and which yarn may be successfully substituted for the manufacturing every sort of cloth, cordage, rope, &c. which is usually made from hemp or flax, and is particularly calculated for making twine for fishing-nets equal to the Dutch twine imported for that purpose, the fibres of the nettles being stronger than those of flax, and not so harsh as the fibres of hemp.

In the course of my experiments on nettles it often occurred to me, that the refuse, and such parts as were damaged in the different processes, with the under-growth, might be applied to useful purposes, and in addition to the nettle manufactory, as applicable to the purposes for which hemp and flax are used. Another source of productive labor of great magnitude would be derived from a new substance, capable of being converted into so many beneficial uses, if my speculations should be finally accomplished. In contemplating these subjects, I was induced to believe the refuse and under-growth might be converted into paper of various sorts, according to the changes they might be made to undergo from the several operations necessary to reduce them to a proper state for that use, having frequently observed, with regret,

regret, the deterioration in the quality of writing and printing-paper, occasioned by the use of cotton-rags in the paper manufactory, which evinces itself even to the most superficial observer, who may only casually open many of the modern publications, and which must be admitted is of the utmost moment, as it endangers the preservation of works of literature. Being convinced of the superior strength of nettle substance, I thought, could my speculations be reduced successfully to practice, it would not only remedy that great evil, and operate as an antidote to the use of cotton-rags in that part of the paper manufactory, but eventually effect a reduction in the prices of books, which for some years have been rapidly increasing, and are now become excessive, to the great obstruction of disseminating useful knowledge among mankind, and contributes to the diminution of our exports in that material branch of commerce.

In addition to the above incentives, the consideration of the high price of paper, chiefly occasioned, as I conclude, from the extravagant price of linen-rags, the impediments to the procuring a foreign supply of them, arising from the circumstances of the times; and seeing that the use of linen-cloth is in a great measure superseded by the very general introduction of cloth manufactured from cotton, which consequently must materially diminish the supply of linen-rags, and probably, in process of time, from the increasing substitution of cotton-cloth for linen, linen-rags, particularly the finer qualities, may be totally annihilated. Urged by all these considerations, which were forcibly impressed on my mind, and feeling assured of the practicability of reducing the substance of nettles to a state necessary to the production of paper, and confident in the superior strength of such paper, if it could be manufactured from a substance so substantial, I was most powerfully impelled to attempt to reduce

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to practice what in theory I had so warmly cherished. The attempt was arduous, not only from an entire want of knowledge of the manufactory, and of the necessary utensils, but I was destitute of any proper implement to engage in the undertaking with any probability of success; hoping however by perseverance to succeed, I proceeded, and found on my first rough trial my expectations realized.

The most favorable condition of the lint, with a view to the paper manufactory, is to begin with it after it is hackled; in order that the fibres may be divested of the skins which inclose them, as when it is intended to make white paper, having gone through that process, it would greatly facilitate the bleaching, and be the more easily disencumbered of the gross particles.

When I signify as my opinion, that the fibres of nettles should be dressed the same as for yarn, previous to their being prepared with a view to the making of paper, I wish not to be understood to convey the idea that the operation cannot be dispensed with; because I conceive that by the aid of such machinery as is in use with the paper manufacturers, or by some improvements therein, they might be brought to a pulp easily, even when the nettles are first gathered, should it, with a view to saving of labor, be deemed necessary; but the practicability of which I leave to the experience which time may hereafter afford.

My operation of bleaching the fibres for paper was performed on the grass, which I deem preferable to the new mode of bleaching with water impregnated with air, by means of oxigi-nated muriatic acid gas, because the old mode of bleaching on grass, weakens the strength of the fibre, leaves it more flexible, and thereby expedites the maceration, which in some degree compensates for the time it requires longer than by the chemical process. But for bleaching of yarn

or cloth made of whatever substance, the chemical process, if scientifically conducted, experience has convinced me is pre-eminently superior, as it gives additional strength to the yarn, greater firmness to the texture of the cloth, and is an immense saving of time, labor, &c.

After the lint is bleached it should be reduced to a proper length for paper, and then macerated in water after the manner of rags, and undergo similar processes till the substance is converted into paper, which may be easily accomplished by manufacturers, and the substance of nettles made to produce paper of the first quality and the most substantial.

In my process the lint was reduced by scissors to particles as minute as was practicable with such an implement; then it was macerated in cold water about ten days, and brought as much to a pulp as could be effected without the aid of grinding, &c. Being a stranger to the composition used to procure the adhesion of the particles, if any is used for that purpose, I tried several glutinous substances, none of which answered so well as a solution of gum, but I am well aware that cannot be generally used, being too expensive.

After the pulp was impregnated with the solution, I then spread it thin on a wire frame of my own construction, which process, except drying it, with me was final. Not being possessed of the means of pressing the paper any more than grinding of the lint, and for want of the film which adheres to the lint being dressed off, I could not completely destroy the color, so as to produce a clear white without picking out every discolored particle, which I so well accomplished, that when I had reduced the staple in length, in that state it was perfectly free from color; the deterioration which ensued when converted into paper, was occasioned by the solution of gum.

My processes were the fruits of my own conceptions, and I desire it may not be understood that I presume to recommend them for practice, being conscious that the manufacturers of paper, hemp and flax, from analogy, are possessed of the knowledge of operations and means more consonant and infinitely superior.

These several manufactures from the new substance of nettles, patronized by the stimulating approbation and recommendation of the Society of Arts, &c. I with all due deference venture to predict will rapidly increase the capital of those individuals who engage therein, afford new employment to the poorer classes of society, and become a new source of wealth to the nation.

EDWARD SMITH.

Brentwood, April 28, 1810.

To C. Taylor, M. D. Sec.

In

In the 25th Volume of the Society's Transactions, page 51, will be found a Communication from Mr. ALEXANDER DUFF, *describing a very material Improvement made by him in the Draw-Boy, a Machine for Weaving Figured Silk Goods, for which Invention he received* FIFTEEN GUINEAS *from the Society in the Year 1807. As no Drawing accompanied Mr. Duff's Communication, the Society take the opportunity of explaining the same by means of the Drawings in Plate 4, which represents the Machine in a further state of Improvement by* JOHN SHOLL, *of No. 11, Elder-street, Norton-falgate, who was rewarded with* FIFTEEN GUINEAS *for the same last Session. The following Communications were received from him, and one of the Machines is preserved in the Society's Repository.*

I HAVE used Alexander Duff's machine (made for the drawing of figures in the manufacture of silk goods) for nearly four years, and as its use is confined to one description of work, I have endeavoured to make this valuable machine of more general use by various alterations, which I submit to your examination.

JOHN SHOLL.

No. 11, *Elder-street, Norton-falgate,*
7th of 2d Month, 1810.

To the Society for the Encouragement of Arts, &c.

Statement made by John Sholl of the Advantages of his Machine over those at present in use.

1.—The rack-tips are not liable to break.

2.—On the racks are cut a double set of teeth on the upper side, for the purpose of working double the number of cords in the same space, which cannot be done by the old method.

3.—A moveable tooth prevents the necessity of cutting a tooth at the end of a comber figure.

4.—The pulley is put on at the end of the axle on the outside of the frame, by which the levers are shortened six inches, and much power gained.

5.—The pulley may be taken off and a winch put on, by which means a small boy may draw a work of any weight.

6.—By this method a careless boy is not liable to draw the wrong cord and spoil the figure.

7.—That with this machine the assistance of a boy, who can be hired for five shillings per week, will answer the purpose of a man at ten shilling per week.

CERTIFICATES in favor of John Sholl's machine were received from the following persons:—

JAMES SCRIVEN, No. 47, Gun-street, Spitalfields;
JOHN LIMERE, No. 8, Baen-street, Bethnal-green;
SAMUEL CEGAMBAR, No. 37, Slater-street, ditto;
THOMAS ATKINS, No. 60, Brick-lane, Spitalfields;
THOMAS ATKINS, Jun. ditto;
WILLIAM CARTER, No. 28 ditto;

SAMUEL

Samuel Ross, No. 22, Carter-street, Brick-lane;
R. Graham, No. 18, New Nichols-street, Bethnal-green;
John Vannet, No. 1, Neckles-row, ditto;
James Vanner, No. 11, Turvill-street, ditto;
John Randell, No. 35, Church-street, Mile-end;
Thomas Cole, at Messrs. Lane and Dalton's, Gutter-lane, Cheapside;
William Sanford, at Messrs. Lea, Wilson, and Co. Old Jewry;
John Kincaid, Spital-square.

A Certificate from Mr. B. Christmas, No. 31, Steward-street, Spitalfields, stated, that he had examined John Sholl's drawing-machine, and thinks it one of the completest that has been made, as it will serve equally well for point or comber figures, by having the racks or saws with fine teeth, and that the edge of them is made secure by being capped with iron, which in the old ones frequently broke off, and that by placing the rigger or pulley on the outside the frame, it makes the working of it much lighter.

A Certificate from Messrs. Lea, Wilson, and Co. silk-manufacturers, Old Jewry, stated, that John Sholl had worked for them many years; that they could testify to the utility of his improved machine for drawing figured works, as he had used it for several of their works, and was at that time drawing one of their rich satin damask shawls, fifty-four inches square, a work which they believe has been hitherto thought impossible to be drawn without the assistance of a second workman.

Reference to John Sholl's Improvements in Mr. Duff's Weaving-Machine, Pl. 4.

Fig. 1 is a plan of the machine, and fig. 2 a perspective view of it, the same references applying to both. A A is a square wooden bar, mounted so as to turn backwards and forwards in the frame B B; on the point of one end of it a pulley D is fixed to receive a line *a a* fastened to it at the highest point, by means of which the axis receives motion from the two treadles of the loom, one of them being attached to one end of the line, and one to the other end of it, *a a*. E E are two rails of wood fixed across the frame parallel to the axis; and *e e* are two brass plates screwed to the rails, and pierced with a great number of holes to receive as many strings, one end of each of which is attached to a central rail F of the frame, and after passing through one of the holes in the above plate, and turning over a round wooden rod G, has a lead weight appended to it; these weights are shown at *b b*, (the rods GG are suspended by strings at their ends from the ceiling of the room); to each of the above strings another is tied just before it passes over G; these are represented by H, as hanging loosely, the upper ends of these strings are tied to horizontal strings extended across the ceiling of the room, and made fast at one end; at the other they pass over pulleys at the top of the loom, in a frame called the table of mullets, and have the lambs or heddles suspended from them; by this arrangement it will be seen that when one of the strings fastened at F is pulled down, it draws one of H, lifts one of the weights *b*, and raises such an arrangement of the lambs or heddles as is proper to produce the figure which is to be woven. The weight *b* draws the string so as always to keep it straight; all that is there-

fore

J. Sholl's Improvement of Mr. Duff's Drawboy.

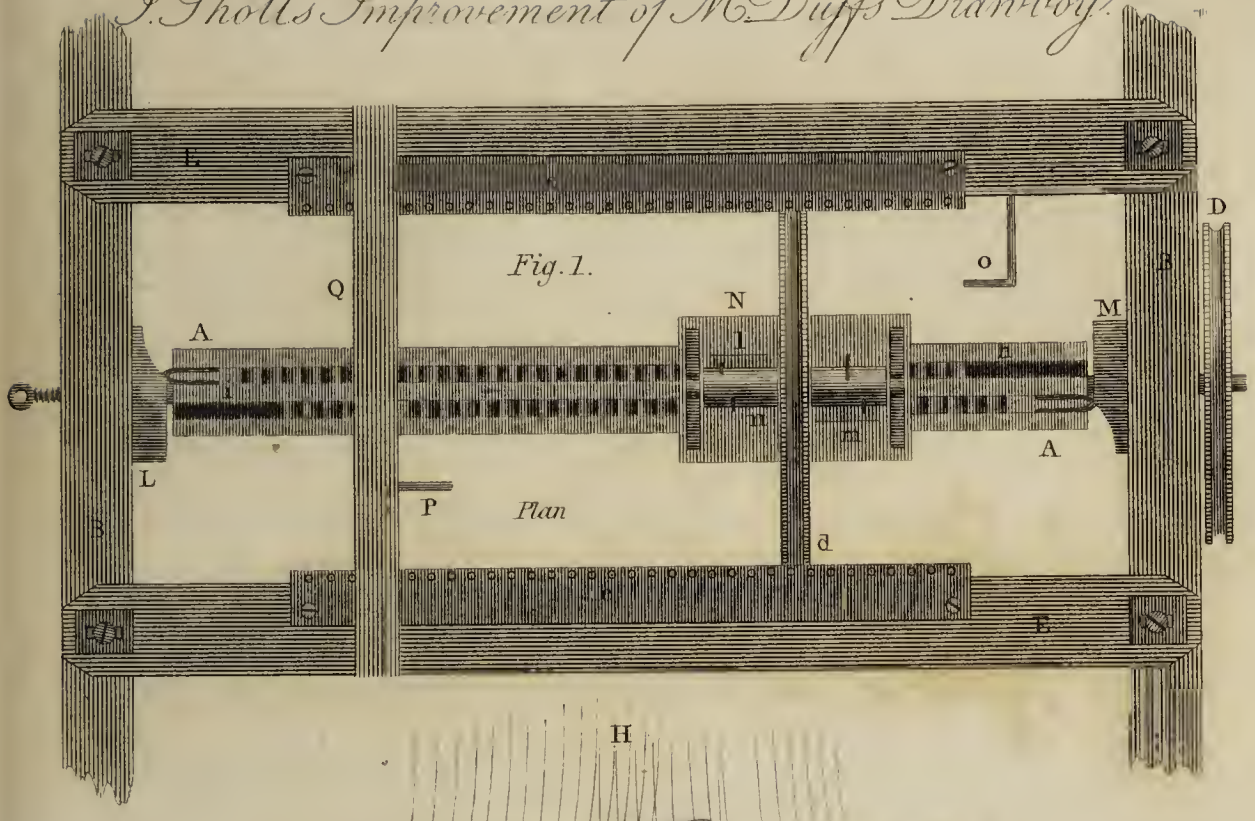

Fig. 1.

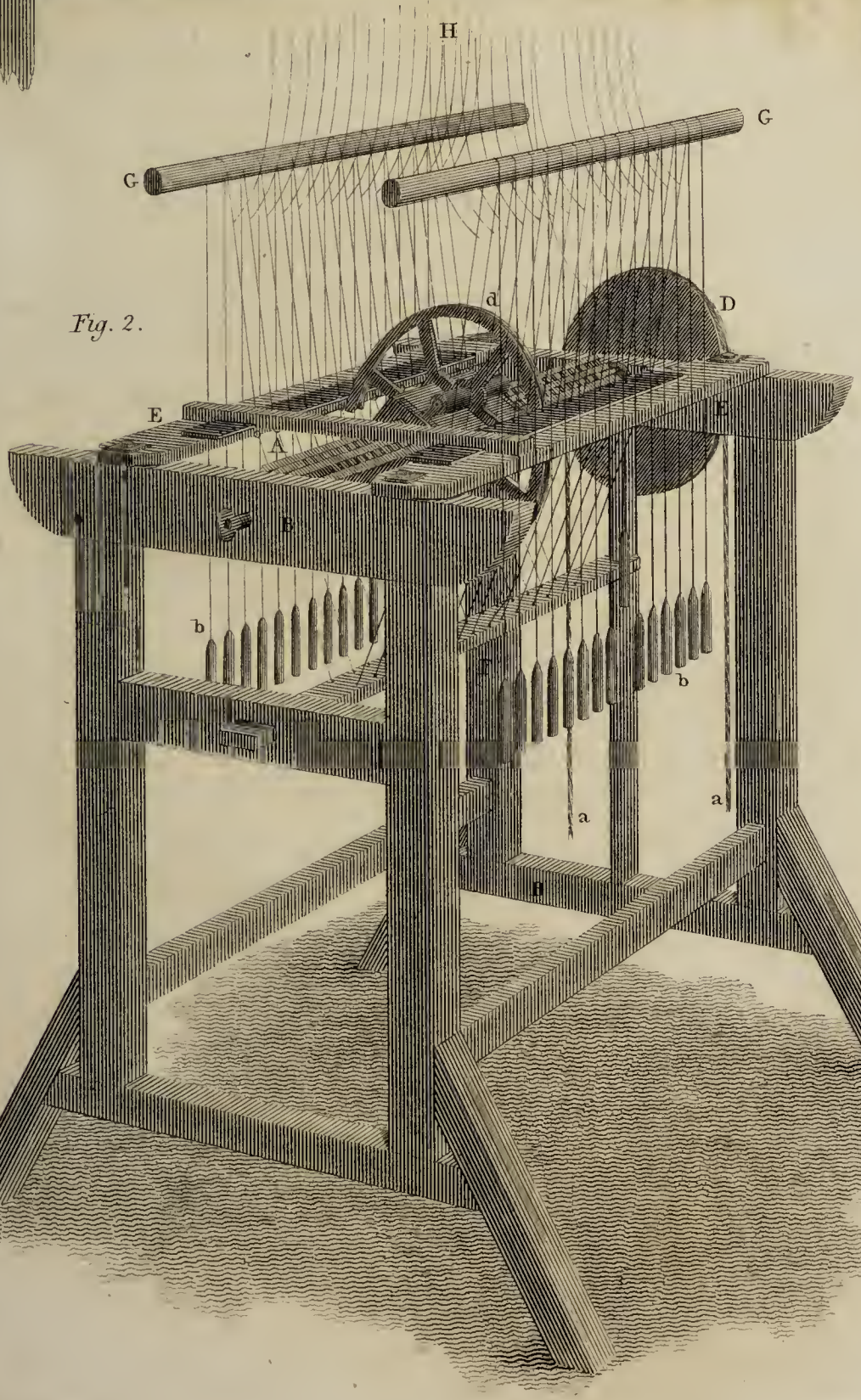

Fig. 2.

Drawn by J. Farey Jun.r

Engraved by S. Porter.

fore necessary is, to draw down the threads at F successively, and raise a different series of the heddles each time; this is the business of the machine, and which it accomplishes in the following manner:—The bar or axis A A has an iron semicircle *d* grooved like a pulley, and each of its ends divided so as to form a clift-hook or claw; each of the strings made fast at F has a large knot tied in it, just beneath where it passes through the brass plate *e*, and which knot stops the farther descent of the weight *b*; now as the axis vibrates backwards and forwards by the treadles of the loom, as before-mentioned; the hook of *d* seizes one of the knots and draws down the string; the weaver throws the shoot and returns the treadles and axis A with the semicircle *d*, allowing the string to take its original position; when the semicircle *d* inclines over to the other side, its opposite hook takes hold of the thread which is next to the opposite one it just quitted, drawing it down, and then returns to the opposite, then to the next to opposite, and so on; this is effected by the semicircle sliding along its bar or axis every time, by means of two wooden racks, *h* and *i* in the plan, let into grooves in the bar or axis; these have teeth like saws, but inclining in contrary directions. The racks move backwards and forwards in their grooves the extent of a tooth at each vibration of the axis, by the action of two circular-inclined planes of iron fastened to the frame at L M, against which the ends of the racks are thrown by a spiral-spring concealed beneath each rack: the semicircle is fixed on a box or carriage N, which slides upon the axis, and has two clicks upon it, one at *l* falling into the teeth of the rack *h*, the other at *m* for the rack *i*; *n* is a roller fixed over the box, and connected with the two clicks by threads wound in opposite directions, so that one is always up and disengaged from its rack while the other is in action. O is a piece of wire

fixed to the frame so as to intercept a small wire projecting from the roller *n* when the axis is inclined, and turn the roller a small quantity. P is another wire for the same purpose, but fixed to a cross-bar Q, which is moveable, and can be fastened at any required place, farther or nearer from the end of the axis. Suppose the roller *n* to be in such position that the click *m* is down and *l* drawn up, the action will be as follows:—The semicircle first inclines to the direction of fig. 2, its hook taking down one string; during this motion the end of the rack *i* comes to the inclined part of the circular-inclined plane M, and moves by its spring towards D, the space of one tooth, which the click *m* falls into: on the return of the axis the rack *i* is thrust back, and the box N and semicircle with it towards L, causing the hook to take the next opposite string; in this manner it proceeds, advancing a tooth each vibration, till it gets so far that the tail of the roller *n* strikes against the pin P; this turns the roller over, raises the click *m*, and lets down the other *l* into the teeth of the rack *h*; this was all the time moving in a contrary direction to *i*, by its inclined plane L, but had no action, as its click *l* was drawn up; this being let down, the semicircle is moved back a tooth at a time towards M, until it meets O, which upsets the roller *m* and sends it back again.

The

The SILVER MEDAL *of the Society was this Session voted to Mr.* JOHN LOCKET, *of Donnington, near Newbury, for weaving Damask Linen Napkins equal to Foreign. The following Communication was received from him, and a Napkin preserved in the Society's Repository.*

SIR,

FROM the encouragement held out by the Society of Arts, &c. for improvements in manufactures, I am induced to lay before them a napkin of my manufacture, which, after much labour and expense, is brought to greater perfection than any before manufactured in this kingdom. I flatter myself that it exceeds any manufactured in Scotland or Ireland. I have shewn it to judges, who are of the same opinion. I have been full thirty years in endeavoring to equal the foreign damask; and it has cost me much money in forming the tackle for it. I have no doubt that the Society will will see it in the light that it merits.

I am, with great respect, Sir,

Your humble Servant,

JOHN LOCKETT.

Donnington, March 11, 1810.

To C. TAYLOR, M. D. SEC.

Explanation

Explanation of the Napkin.

THE warp of the napkin is formed of brown linen, and it is wefted with white, so that the figures or designs appear on one side brown, on the other white. In the centre of the napkin is an imperial eagle, with a coronet above it. It is beautifully bordered with representations of various flowers hanging in elegant festoons.

Any nobleman's coats of arms could be displayed on table-linen in a similar manner, or any kind of figure introduced.

In the 23d Volume of the Society's Transactions, Page 223, will be found an Account of the GOLD MEDAL *of the Society having been voted to Mr.* WILLIAM CORSTON, *of Ludgate Hill, for a Substitute of his Invention for Leghorn Plait, for Hats, &c. The following Communication, on the full Establishment and Success of this Manufacture in England, has been since received from him.*

DEAR SIR,

HAVING been honored, in May 1805, with the Gold Medal of the Society, for a substitute for Leghorn-plait for hats, it is with great satisfaction that I am enabled to inform you, that this country is now beginning to reap those advantages which I foretold to the Society six years ago, and that many hundreds of women and children are at present employed

employed in the various parts of the kingdom, in the manufacture of this article.

I sold to two persons, in less than two months, upwards of 5,000 scores, and had an order from a third for 2,000. But this bears but a small proportion to the demand, and evinces the truth of the statement I made of the great advantages likely to result from the introduction of this new branch of manufacture into this country.

In Joseph Lancaster's Book on Education, I have pointed out further advantages which may be derived by the country at large, from the cultivation of waste and barren lands for the production of the material of which the British leghorn is made. This has been proved by experiments which I have made on Bagshot Heath, by favour of the Earl and Countess of Harcourt, and in Bedfordshire, by the benevolence and public spirit of the Duke of Bedford, and on barren land in Norfolk, near my native place. Indeed no soil can be too barren for this purpose, provided the seed will lay. I have shewn that 2,000 acres might be annually cultivated in the growth of this article, and that a quantity of such land might in succeeding years be brought into more productive cultivation: but I am afraid that this plan is too simple to be adopted, although I cannot but yet hope that the agricultural societies of England will turn their attention to a plan which will bring waste lands into cultivation, and also provide employment for thousands of poor children. If Government would grant 3,000 acres of the land which lies waste on Bagshot Heath, for a few years, without any fine, and afterwards on an increasing rent, according to the improvements of the soil, I would raise, in *straw alone*, what should produce an article for industry for which upwards of 20,000*l.* would be paid annually for the employment of poor children. It is a pleasing sight for Englishmen to behold

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the superb buildings which are appropriated as asylums for the children of our soldiers and sailors; but in times like these, how desirable is it that buildings of only one story high should be erected in populous parishes, which might answer the double purpose of schools of industry and instruction, and thereby relieve parishes from the burthen of the maintenance of poor children, and also bring them up in habits of industry and sobriety. In this way thousands of children may be employed from seven years of age, until they arrive at an age sufficiently advanced to go out as servants.

As by the mere invention of the *splitting of a straw*, a source of employment has been discovered, which has increased the returns in that branch not less than 3 to 400,000*l.* annually, I feel myself urged to call the attention of the discerning part of the public to a new branch of industry, which I make no doubt will, in a very few years, add nearly an equal sum to the national industry, and also be a great means of bringing into cultivation thousands of acres of land now lying waste. Since the introduction of spinning by hand, no source of employment has been discovered which promises to afford occupation to so many thousands; spinning by hand has been superseded by the inventions of machinery, but I believe it to be impossible for machinery to absorb this branch of manual industry; the only spindles, wheels, or bobbins engaged in this work, will be, I trust, the fingers of little children.

Some persons may endeavor to cast a shade over these expectations by considering the prevalent attachment to the wear of straw hats as the whim of the day; but I believe that the superior comfort, in summer weather, arising from the wear of a light hat in preference to a heavy one, will induce gentlemen more and more to make use of the British leghorn;

leghorn; and as to the predilection of ladies for hats manufactured of split straw, I think I hazard very little in considering that as established; and when to our home consumption is added a consideration of the demand for the East and West Indies, the coast of the Mediterranean and South America, I think myself very safe in asserting, that these manufactures will employ not less than 60,000 children.

Our poor's rates amount to more than 5,000,000*l.* per annum; and there can be no remedy for so great a burthen equal to the setting the children of the poor to work, so that they shall earn their own bread, instead of being chargeable to the parish. It is true, that the demand for straw-plait has caused an increased quantity to be made; yet the demand is still superior to the quantity; and in the spring, the price often advances from 30 to 50 per cent. beyond its fair value, even allowing sufficient profit to the poor employed, and the dealer in the article. I believe, therefore, that this branch of manufacture is still in its infancy, and that it is likely to have great permanency; and although it may, by some, be considered as an insignificant source of revenue, yet when it is considered that Providence has given us the means of improving the agricultural state of the kingdom, in raising the raw materials, and that so many thousands of our poor may be employed in its manufacture, I trust that every assistance will be afforded to so extraordinary a source of national wealth.

If any person should doubt my arguments, I will beg leave to state a fact in confirmation of my positions. I once had the curiosity to put into the scale some straw I was about to sell, and I found that it netted upwards of twenty-three pounds sterling per lb. weight. If therefore an article, which in its unmanufactured state is considered as of little worth, can, merely by the industry of children, be rendered

so valuable, I think I risk very little in affirming, that by the encouragement of the *British Leghorn*, together with that of *split-straw*, we gain a sure means of bringing our waste and barren lands into cultivation, and by the employment of our poor children, we acquire an infallible means of greatly diminishing our poor's rates.

In order that the British plait may equal the Italian in fineness, I particularly recommend that the rye should be sown on the most waste and barren land, without any reference to its produce but merely of the straw, the sale of which would afford ample remuneration; and I should be happy to take the produce of from 50 to 100 acres of such land, provided it lay convenient to the place of my manufactory. By such means, the most unproductive wastes will become valuable, and a great source of advantage opened for the employment of young children, and persons incapable of hard work.

An opportunity is thus offered for benevolent persons to build cheap schools in villages, and assemble the children of the poor together, to whom literary instruction might be given, and the children enabled to earn their own bread; and the whole effected at a trifling expense.

I flatter myself that it will give pleasure to the Society to find that I have not neglected an object which has merited their attention, and which will be the means of saving immense sums to this country, which have heretofore been sent abroad for the purchase of an article which our poorest lands and feeblest people can furnish.

I remain, Dear Sir,

Your obliged and obedient Servant,

WILLIAM CORSTON.

Ludgate Street, May 10, 1810.

To C. Taylor, M. D. Sec.

PAPERS

IN

MECHANICS.

The SILVER MEDAL *of the Society and* TWENTY GUINEAS *were this Session voted to the Rev.* JAMES BREMNER, *Minister of Walls and Flota, Orkney Islands, for a Method of making any Ship's Boat a Life-Boat to preserve the Lives of the Crew in imminent danger. The following Communication was received from him, and an Explanatory Engraving is annexed.*

SIR,

I HEREWITH send you a copy of my plan for converting every ship's boat into a temporary life-boat; and without using a single argument more than the account contains, I leave the matter entirely to the judgement of the Society, but not without hope that it will meet their approbation.

In that case the recommendation of so respectable a body, whose institution is solely designed for promoting public good

good, cannot fail to have a very powerful effect towards removing vulgar prejudice, which is generally difficult to overcome, and which in the present case is the only obstacle that can be adduced to prevent the universal adoption of the plan proposed.

I remain, Sir,

Your very obedient and humble Servant,

JAMES BREMNER.

Walls Orkney, Sept. 16, 1809.

To C. Taylor, M. D. Sec.

On the Preparation and Uses of Ships' Boats as Life-Boats.

Having a great many years ago witnessed a melancholy scene of shipwreck, and seen men perishing at little more than the distance of one hundred yards from the shore, it forcibly struck me, that though there was no possibility of getting from the shore to them, yet there was a great probability that means might be found, by which those in such situations might with safety be enabled to effect their escape to the shore; and further considering that the very precarious aid of some accidental piece of wreck (under every disadvantage and in a tempestuous sea) sometimes serves to save life, I was confirmed in the opinion, that some method might be devised, which, upon good grounds, would hold forth the promising prospect of safety in all the common

and

and general cases of shipwreck. Hence it was that to devise such a scheme became the object of my research ever after.

The following plans (especially the first) are so simple, and the effect so obvious, that I cannot allow myself to think, that any seaman can entertain the smallest doubt but that a boat so prepared would live in any sea whatever, could neither sink nor overset, and could carry in safety a number of people, in proportion to her size, over a bar, or from the wreck to the shore through any surf.

That empty casks must float, almost wholly above the surface of the water, is so clear, that no person can be so absurd as to question it; and it is equally certain that every cask will support weight of any kind in proportion to its size. In order then to accomplish the end proposed there is only one thing more wanted, and that is, by means of sufficient seizings or holdings, to secure the casks in their places. Were you to tell a seaman that he is not master of this mighty operation, it is easier to conceive than to express the contempt he would feel, and the energetic reply he would probably make to such a supposition. If then these are undeniable points, it must follow, that wherever the boat can be had recourse to, all that is contended for in the plan must be granted.

It no doubt has been upon these simple and obvious principles that those corporate and public bodies, and hundreds of seamen to whom the plan has been communicated, have so readily and entirely approved of it. But however respectable and authentic these testimonies (afterwards to be mentioned) may be, I lay no stress upon that point, neither do I ask any credit for it, but freely submit my statements to the great body of seamen in general, leaving them to be judged of, not with liberality only, but with severity, con-

sidering that it would be a crime of the first magnitude, to advance a single argument or suggestion that could have the smallest tendency to mislead, in a matter so solemn and important, as where life and death are concerned.

Were I to go back to cases that are well known to have happened, I could easily point out many, wherein this plan had been thought of, there can be no doubt but it would have been attended with the happiest consequences; and probably the recollection of many seamen may furnish cases of the same kind, which have happened within their own knowledge.

I shall only add, that I expect no benefit nor advantage whatever to myself from my perseverance and labours on this subject, nor reimbursement for an expense of some hundred pounds which it has cost me in repeated journies to Edinburgh and London, as well as in experiments, which a living of less than seventy pounds a-year could very ill afford; but I shall nevertheless reckon myself amply rewarded, if what I have to propose shall at any time, or in any case, prove the means of relieving from the deepest distress, and of rescuing from otherwise inevitable death, even a few of those who have had the misfortune to be involved in all the horrors of shipwreck.

Mariners are unavoidably exposed to incomparably greater hardships and sufferings, than what are to be met with in any other line in human life.

Whilst the labours of all others are moderate, and find relief at stated intervals by day, and repose by night, the seaman must contend with the storm so long as it lasts, and encounter danger at a moment's warning, whether at midday or midnight. Whilst the tempest rages, no respite can be allowed him; he must keep his station without intermission, and after toiling above strength and above measure, it is often his hard fate to be shipwrecked at last.

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The complicated distress attending this frequent and fatal disaster, it would be in vain to attempt to describe in any words, nor is it possible to conjecture nearly the number which is added annually to the innumerable multitude of dead which the ocean contains.

Sometimes several hundreds in one ship are involved in this direful calamity, where the misery of each sufferer is increased, in proportion to the accumulated woe that surrounds him; the cry of despair is heard on every side, and in distraction each exclaims, What shall we do?

Amidst overwhelming waves and wreck, the mariner suffers in his person all that a living man can undergo, and in his mind all the anguish that despondence can create, heightened by the agonizing thought, that he is never more to behold wife, child, family, or friend; still however amidst all his sufferings, an ardent love of life prevails, and the hapless mariner, struggling hard to preserve it, clings to whatever seems to promise a momentary reprieve.

In the mean time the wreck is rapidly giving way, some are washed away in one place, and others in another; those who remain redouble their efforts for life; but alas! they strive in vain; one decisive blow has dashed their last and only support to pieces, and all are going down together—a general shriek is heard—to be heard no more! the melancholy scene has closed, and neither survivor nor wreck is left behind.

Any plan then that has for its object to afford relief in situations of such extreme distress, and which seeks to extend the same benefit to thousands of perishing men in future ages, will no doubt meet with a favourable reception from every humane and benevolent mind.

But humanity and true benevolence, are not merely

speculative, but active principles; and wherever they really exist, the helping hand is instantly stretched forth, to execute the dictates of the feeling heart.

As no subject can be more interesting to individuals than the present, nor more important to society, may it not then be expected, that every friend to humanity and to his country, will not only heartily wish success to the present plan, but also lend his best assistance to have it brought into all the practical effect, of which it may be found susceptible.

It is to be understood, that the plan is intended to apply to cases of shipwreck in general, and that it may very often succeed even in cases of extraordinary difficulty and peril.

This will comprehend the far greater number of all shipwrecks that happen, and the author thinks himself warranted to say, that no solid objection can be offered to the effectual operations of his plan to this extent, and that it will be found fitted to answer all the purposes of a life-boat, by saving lives, where otherwise men must inevitably have perished.

At the same time he begs it may be understood, that he does not speak with this confidence, from his own opinion only, however well-founded in principle and experiment it may be, but because the plan itself, after repeated investigation, has received the unanimous testimony and approbation of professional men, and of men too who must be allowed to be the most competent as well as the most respectable judges in the kingdom, namely, the Trinity House of Leith, in whose records a copy of it will be found.

The Report of the Highland Society of Scotland confirms that in their Committee appointed to witness the experiment at Leith, there were naval men of that number who were competent

competent judges, and in whose skill they could confide, and for this reference is made to the Appendix of their second volume.

It has been repeatedly submitted to the Trinity House of London. It was first transmitted to them by Lord Melville, the treasurer of the navy, and their answer under the hand of their secretary is inserted in the forementioned Appendix, signed James Court.

In the next place, the plan having been laid before the Royal Humane Society, and they not being naval men, do submit every essay of that nature to the Elder Brethren of the Trinity; and in consequence of their approbation a premium of five guineas was given by the R. H. S. as appears from their printed Reports 1800 and 1801.

And to these attestations, might be added, the subscribed approbation of more than one hundred ship masters, whom the author had occasion to see only accidentally, and whose subscribed names are now in his possession.

It is under the sanction of such authorities and documents that it is now offered to the public, and they are such as must be satisfactory to every impartial and candid mind.

They have been obtained without interest, favour, or friend, and small premiums have been given without the author's knowledge, till informed by letter that his plan had received this mark of approbation.

It is impossible therefore to ascribe so honorable testimonies and gratuitous bounties to any other motive than to the conviction of the utility and efficacy of the plan, and an ardent desire to promote an object so devoutly to be wished, as the preservation of lives in cases of shipwreck.

The inventor trusts that his statements will shew, that he is not unacquainted with his subject: and he shall only add, that he has had more than forty years experience in the use

of boats, among dangerous tideways and rapid currents, such as the Pentland Frith, and all the other channels among the Orkney Islands; and that he has been several times at sea on shipboard, in storms that were attended with shipwrecks; and that from such experience he is perfectly convinced that his plan is sound and unexceptionable, and is confident that the period is not very distant, when it will come into as great repute and general use as life-boats, properly so called, are now known to be.

The plan may be executed upon boats of all dimensions, and the largest, provided they could be got out, would be found the most advantageous; but all circumstances considered, the size deemed in general best adapted for the purpose would be any boat from sixteen to twenty feet in length, which is to be prepared as follows.

Reference to the Plan of the Rev. Mr. Bremmer's Preparation of Ship Boats as Life-Boats, Pl. 5, Fig. 1 and 2.

Two additional ring-bolts are to be fixed in the keel within-inside of the boat.

One to be placed one-third of the boat's length from the stem.

The other one-third from the stern.

Two augur bores are to be put through the keel without-side, and close to the garboard stroke.

One of these bores to be put about half way betwixt the ring in the stem, and that next to it in the keel.

The other about half way betwixt the ring in the stern, and that next to it in the keel.

Plugs

Revd. Mr. Bremner's Life Boat.

Fig: 1.

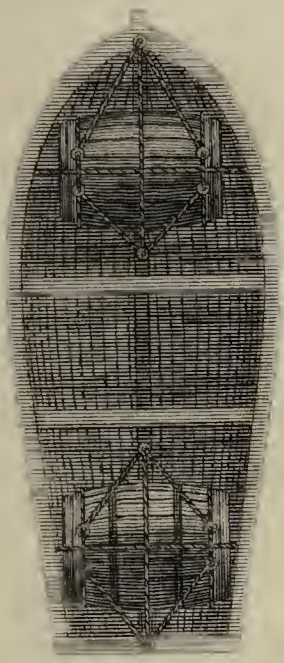
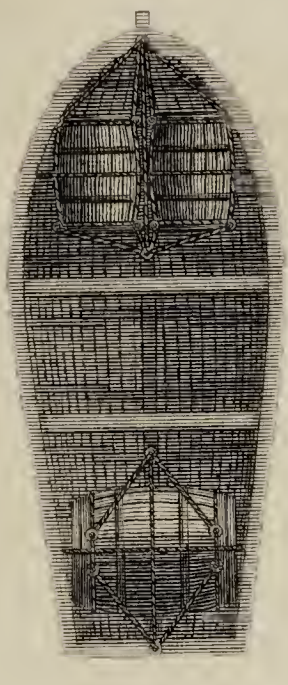


Fig: 2.



Mr. Henman's Mooring Block for Ships.

Fig: 3.

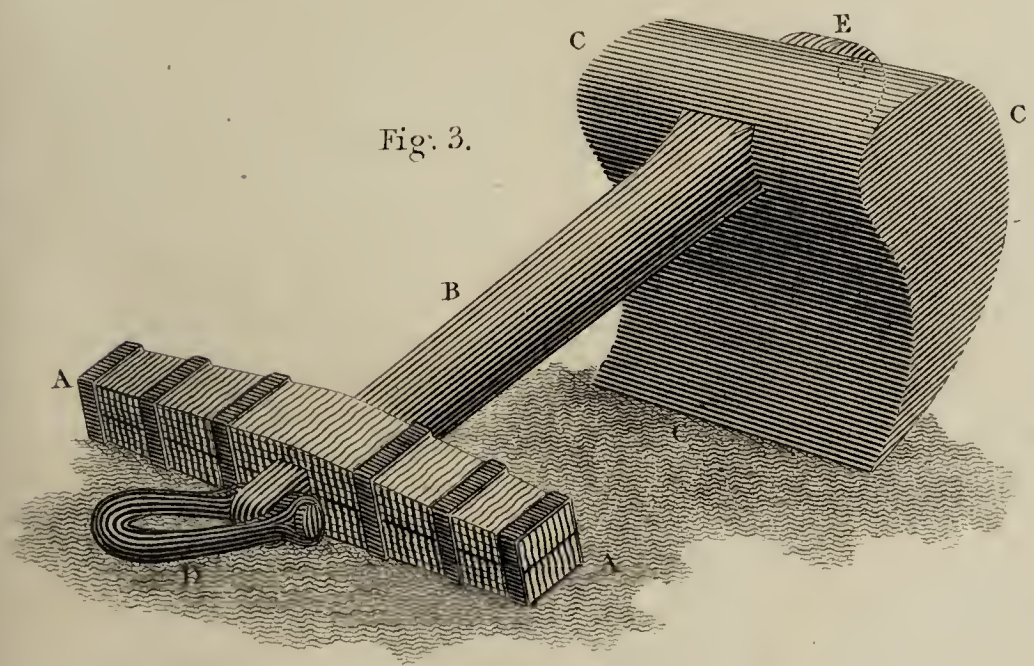


Fig: 4.

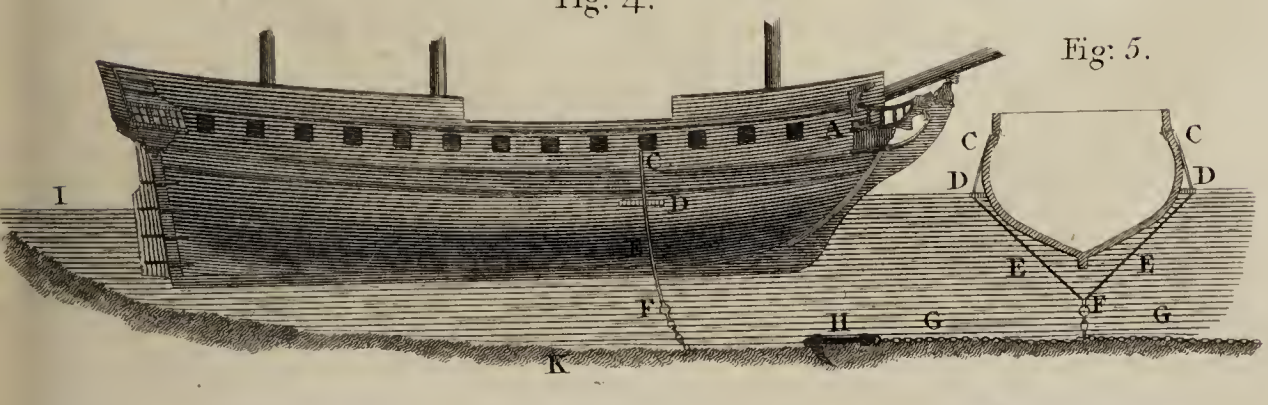


Fig: 5.

Drawn by J. Farey Junr.

Engraved by S. Porter.

Plugs may in ordinary be put into these bores, to be struck out, when occasion requires.

Those ring-bolts which are in ordinary in every ship's-boat, the two additional ring-bolts in the keel, and the two augur bores, are all intended as secure points of fixture, to which seizing ropes are afterwards to be attached.

In the next place, two tight empty casks, (see fig. 1.) are to be provided, of such dimensions that their length may fit to the width of the boat, when laid athwart ship, and their diameters to be about three feet, and if larger so much the better.

Each cask must be furnished with a sling on each end, and each sling to have two eyes on it, about six inches asunder, and the slings so put on the cask as that the eyes may be on the upper side when laid into the boat, that the seizing rope may pass through those eyes, in their way from ring-bolt to ring-bolt.

One of these casks, so prepared, is to be laid in foreward, and the other aft, and each cask so near its respective ring in the keel, as only to leave sufficient room for passing the seizing rope through the ring in the keel.

By this means, the vacant space to be then filled up with cork, will be left betwixt the cask and the bow foreward, and betwixt the other cask and the stern aft.

The requisite quantity of cork, according to the dimensions of the boat, and the quality of the cork, may be about a hundred and a half, or two hundred weight, for each end of the boat, and that for each end ought to be made up into two separate bundles, each bundle being fitted to the width of the boat, and the uppermost one forming an arch from gunwale to gunwale.

The cork is to be made up in canvas, done over with soft

pitch for preservation, and each bundle marked and numbered according to its place.

The cask and cork being laid into the boat, seizing ropes are then to be applied for securing them in their places.

Here it is to be observed, that the single turn of rope which is to go through the augur bore in the keel and round all, should be the first made fast, that the other seizing rope (which we shall suppose to have been made fast to the ring in the stem) may, in passing through the eyes on the sling, take in the surrounding rope betwixt the two eyes, which will thereby prevent the surrounding rope from slipping to either side of the cask.

The seizing rope having passed through the eyes on the sling, is then to be passed on through the ring in the keel, and thence back again in the same manner, through the eyes on the sling on the other end of the cask, to the ring in the bow; and lastly, the seizing rope is to be brought directly from the ring in the stem to the ring in the keel, by which it will cross the cask at the bung or middle part of it: the other cask and cork aft are to be secured in the same manner.

The preparation will be completed by attaching a bar of lead or pig-iron, of about two hundred weight, to the keel within-side, by means of the ring-bolts in the keel or otherwise.

The same plan may be executed with equal effect, and nearly with the same expedition, by the following alteration and arrangement.

Instead of one large cask, two lesser ones may be used in each end of the boat.

These are to be laid in lengthwise, fore and aft, in the boat, along side of each other, and both together ought to fill the width of the boat.

These

These must also be furnished with slings on each end, and with two eyes on each sling, and these eyes so placed as to be about two inches above the horizontal diameter of the cask, one eye being on each side of the cask when the sling is put on.

The seizing-rope being now made fast to the ring in the stem, is to be passed through the eyes on the slings on one side of the cask, then through the ring in the keel, and so back again through the eyes on the slings on the other side of the same cask, to the ring in the stem. The rope is then continued on till it has passed in the same manner on both sides of the adjoining cask, and the last turn is to be made directly from ringbolt to ringbolt, passing over and above the surrounding rope, which will thereby be brought down in the middle betwixt the two casks, and made closely to compress them on each side.

The same process is to be followed as to the casks aft, where the dimensions of the boat will admit of it, and where otherwise one large cask athwart ship may be used, as in the plate, fig. 2. It was in this manner that the experiment at Leith, hereafter to be detailed, was made, and all the cork that was used on that occasion, was about one hundred weight put into the narrow part of the boat aft, in order to raise a common porter cask placed above it to a convenient height. The preparation of the cork bundles in this case will differ somewhat in their shape from those in the former plan, but as the purpose of them is the same, namely, to fill up the vacant spaces betwixt the cask and the boat, a particular description of them seems quite unnecessary; only it may be observed, that as the diameters of the cask foreward are considerably less than that in the former plan, so much of the cork ought to be placed underneath, as may serve to raise the upper side of the cask about four inches above

above the gunwales, it being evident that the higher they can be raised with sufficient security, the more effectually all possibility of overturning will be prevented.

The same quantity of ballast is to be used in this case as in the former, and is to be applied in the same manner.

With respect to boats of small vessels, a single cask foreward and another aft, without any cork, will be sufficient.

Each cask to be about the size of a hogshead, and to be set on end, or leaning obliquely towards the rings in the stem and stern, to which they are to be secured, and at the same time to two other rings placed in the keel, proper for that purpose: these casks, from their position and power, would effectually prevent sinking or upsetting: and as the crews of such vessels are few in number, their boats might support them safely through any breach into shallow water.

The foregoing plans are founded upon unquestionable principles, and constructed according to a regular method. They keep in view the difficulties to be encountered, and provide against them by making a few necessary preparations in due time.

Were this attended to, all the confusion and embarrassment which arises from sudden alarm, and the distress that must attend a total want of suitable means, would be prevented, and an encouraging prospect of safety held out even in the most perilous situations.

The want of timely forecast, and the neglect of means that were in our power, never fail to occasion the bitterest self-reproach, and the most painful vexation, whenever we are overtaken by misfortunes, which a little prudence might have prevented.

Having however but too much reason to apprehend that such prudential provisions as have been stated, will still be neglected, in spite of every suggestion and consideration

that

that can be urged, I shall now propose a third plan, which, though inferior to the former, as a ship with jury masts, torn sails and a temporary rudder, is to one in perfect good condition; yet, considering that this inferior plan, like the disabled ship, may gain what was despaired of, and save what was given up for lost, I proceed to state it:—

This plan will consist in the application of cask only, These, if stowed closely and so as to fill up as well as possible one-third part of the boat forward, and one-third aft, would effectually prevent the boat from sinking or oversetting.

Upon this plan, in order the better to secure and combine the cask, the end of a sail should be in the first place thrown into the bottom of the boat, and the cask being stowed upon it, the other end of the sail should then be doubled over all: the seizings are then to be made through holes struck any where through the bottom and sides, wherever the passing of a rope may be found necessary, or of any use for confining the cask.

The constant and general idea, that the utility of every boat depends upon the tightness of her bottom, and her completely resisting the admission of water, opposes itself strongly, and almost irresistibly to the directly opposite idea, that water freely admitted could do no injury; nay, so strong is the received opinion, that it may be very difficult to pursuade some, that large openings in the bottom would prove a real advantage; it is however undoubtedly true, that in the present plan this would really be the case.

It is therefore very material to observe, that neither the number nor the size of the holes struck through, are of any consequence, as to the water in the boat; on the contrary, they would be so far from being detrimental, that, to a certain extent, they would be of advantage, as they would serve to discharge, in proportion to the buoyancy contained, whatever

ever top-water might be withinside, above the level without, and which the boat would otherwise retain as a load and dead weight, if she were every were perfectly tight: whereas, in proportion as the buoyant power operated in raising her, the top-water would instantly subside through the holes in the bottom, and thereby render her more lively, and to swim higher out of the water.

From not attending sufficiently to the fact now stated, it has probably happened, that the plan we are at present describing has never been attempted; but whoever will take the trouble to consider the matter for a little may soon be convinced that they may, *without scruple or hesitation, make as many holes, and of whatever size,* as they may judge necessary for passing ropes, wherever they can serve for effectually securing the casks in their places.

The only point chiefly to be attended to, is never to attach ropes to any tender part of the boat, such as the gunwales or thwarts, but to such parts as possess the greatest strength, and in which entire confidence may be placed.

As the largest boats have strong timbers, this plan might probably succeed best if applied to launches and long-boats.

Small anchors that have iron stocks, and which could be laid in the bottom of the boat, would serve for ballast, though probably ballast in large boats would not be very necessary.

The holes to be struck through may be pierced with a marling-spike and mallet betwixt the timbers.

The power and effect of empty casks is well known, the application of them being a common expedient, used almost every day for the purpose of floating stranded or bilged vessels of great burthen.

How easy then it must be, by the same means, to render a boat buoyant to any degree that could be wished, may be abundantly

abundantly evident to every person not obstinately blind to undeniable fact.

The thing is so self-evident as to require no proof, that if both ends of the boat be tolerably filled with empty casks, she will not only thereby be secured against upsetting or sinking, but will be rendered extremely buoyant, provided the casks be effectually secured in their places; and in full proof of this fact, the experiment hereafter to be narrated, was made almost entirely with empty casks.

The inventor having little hope that the far better and more eligible plan by timely preparation will be adopted, is the more solicitous to gain attention to this third mode, by means of cask only, because necessity, which is often the mother of persuasion as well as of invention, may compel the unfortunate mariner to have recourse to it.

Seamen being above all others expert in the use of ropes, and expeditious in making secure seizings, which is the great and only thing wanted, the inventor begs leave confidently to affirm, that whenever it shall be tried it will be found perfectly safe and successful.

Let therefore no scruple or hesitation be made in striking holes through the boat, any where, and of any number or size that may be found necessary for passing ropes for the effectual confinement of the casks. This plan will apply *not to one boat only, but to every boat in the ship*, provided there be a sufficiency of casks on board.

If then the two great points upon which I set out, namely, the powerful buoyancy of cask, and the peculiar expertness of seamen in every operation where ropes are to be used, be duly considered, they will sufficiently vindicate and verify all that I have stated; and unless the one or the other, or both, (that is, the power of cask, and ex-

pertness

pertness of seamen) can be shown to be false assumptions, the conclusions which I have drawn, can neither be denied nor resisted.

Observations and Remarks relative to the foregoing Plans.

1.—From the detail in the description it may be alleged, that the situation would not admit of so much time as the preparation would require.

It is granted, that in some cases this might be true, if nothing had been done before-hand; but surely such neglect ought by no means to be imputed as any defect in the plan, but ought to be ascribed to its true cause, the remissness of those who would give themselves no trouble to avail themselves of it.

Slings fitted to the cask, two additional ring-bolts, two augur bores, and the requisite quantity of cork, are all things so trivial and so easy to be provided, that to be without them must appear an unpardonable neglect, and if these were in readiness the short space of ten minutes would be quite sufficient for laying them in their places, and securing them.

It is evident to demonstration, or it might be easily proved by experiment, that with respect to the two first methods stated, and where the necessary provisions had been made, that the whole could be executed in ten minutes, and therefore any objection in point of time can have no place.

2.—When there is a prospect of the ship holding together for some time, the boat may be kept in readiness and in

in reserve, or may be served on shore by a rope, and hauled off again, as often as occasion may require; and if to be hauled off, it might be a necessary precaution to pass a rope round her lengthways to assist the ring-bolt in the bow, and in every case the attachment and connection of the boat with the vessel ought to be well secured till the moment she is to be cast off for the shore.

3.—It is of no consequence in what manner this boat is to be got into the water, whether after-end or side, by means of handspikes or otherwise, as no water can hurt her, though it might be more desirable, if it could be done without filling her in midships, as in that case she might be conducted through very heavy seas without filling at all, or receiving more water than might be easily baled out.

4.—It is material to remark, as it may not generally be attended to, that the plan always supposes the midships to to be full of water; but that the requisite buoyancy of the boat is not injured by that circumstance, nor will the addition of people, in so far as they are immersed in the water, prove any additional burthen; this will be perfectly clear to all who understand this part of the subject, however improbable it may appear to others, and the remark serves to shew that it would be a good rule, in such circumstances, for the men to keep themselves immersed in the water in midships as far as possible.

The idea of placing men in the midships of the boat whilst at the same time it was full of water, would probably startle a landsman not a little; such therefore may be told, that every life-boat is supposed full of water, and that to imagine there could be any man in one with a dry thread about him would argue a total ignorance of the matter.

5.—It is to be kept in mind that the danger is always supposed to be extreme, and that the present plan affords the

the only posssible chance of saving life; therefore whatever hardship or difficulty there may be in putting it in execution is entirely out of the question; any other view of the subject is altogether foreign to the purpose.

6.—If any are of opinion that cork ought alone to be used for buoyancy, there can be no doubt of its answering the purpose perfectly; at the same time the author is of opinion, that a combination of cork and cask would be found more convenient, and in some respects preferable.

Water-casks would always be at hand, and to save the expense of cork, might on that account be preferred by some; but independent of this consideration, casks are by more than one-half lighter than their bulk of cork, and thereby more than a double advantage in favor of buoyancy is gained by using them.

There is but one objection to the use of casks, and that is, that they may be stove in; but if the great strength which they possess from their construction be considered, and at the same time that they are strongly defended by the boat, this objection must appear of no moment at all.

7.—Every boat, prepared as has been stated, is fit to carry mn equal in weight to something more than one-third of the boat's whole burthen, and one of eighteen feet in length can carry from fourteen to sixteen people, and have sufficient room for working a pair of oars, which ought by all means to be short ones.

The disadvantage of working long oars upon a low gunwale, and in a high running sea, is too obvious to need any thing more than to be just mentioned.

8.—As all depends upon the points of fixture, too much attention cannot be paid to their sufficiency, and though those stated in the plan, are judged to be perfectly adequate to the purpose, yet any person wishing for more, *may add them*

them at pleasure, by rings of rope in the stem and stern-posts, as in the Greenland boats, by more rings in the keel, or in addition to the seizing-ropes, a netting of small rope may be made to cover the whole foreward, and another such may be applied in the same manner aft, and by these means every possible security that can be desired may be obtained.

9.—It is material to observe, that no dependence ought to be placed on seizings connected with the thwarts or gun-wales, unless it were only as aids to the points of main dependence.

The gun-wales, more than any other part of the boat, are liable to damage, and may very possibly be injured in hoisting out, or before getting clear of the vessel.

The two augur bores in the keel are infallible holds; easy access may be had to them while the boat is on deck, and a rope may be passed through them in a moment.

This seizing, besides the security it affords for confining the buoyancy, adds considerably to the strength of the boat, and therefore ought to be preferred to any other mode of fixture.

10.—No rule can be laid down that will fit all boats, as to the precise quantity of cork, or size of cask, their shape and dimensions being so various; but from the general rule that has been stated, and the purpose to be served, every man may easily adjust his apparatus to his boat, or make such little alterations on the boat as may be found convenient or necessary.

11.—No sail can hurt this boat, as it is supposed she has only to go right before the wind, and therefore a sail may be used with very great advantage. This would render oars unnecessary, and would be infinitely preferable. It is almost needless to add, that the boat could be steered in midships.

12.—The great benefit derived from the common life-boats is well known, and universally acknowledged; but they are very far from being adequate to the calamity they are intended to remedy.

Their number comparatively is very few, and the sphere of their operations extremely limited.

In darkness by night, and in thick snow by day, when their aid is most wanted, they are of no avail.

Storms may blow, and sometimes have blown so hard as to defeat their utmost exertions, and even in the most favorable cases, require a considerable time before they can reach the wreck; in the mean time the vessel may be dashed to pieces, and all hands lost.

The very pre-eminent advantage of the ship-boat in these and several other respects is very conspicuous.

This boat is wherever the ship is, and recourse may immediately be had to her; is of equal utility by night as by day, and in the thickest as well as in the clearest weather; and whilst the life-boat, with extreme slow progress, must be impelled against wind and sea by a force superior to both, the ship-boat has only to drift with ease before the storm.

13.—As it may serve to gain confidence with those who are not otherwise qualified to judge of the plan, it may be observed, that the ship-boat is prepared upon the very same principles as the life-boat, and that these principles are applied to greater advantage in the former than in the latter. The quantity of buoyancy in the ship-boat, being considerably more in proportion to her size, and being carried to a greater height, gives more security against oversetting; and if to these advantages there be added the far greater one, of having only to drift before wind and sea, no shadow of doubt remains of the success of the ship-boat over that of the other.

Lastly.

Lastly.—This plan carries with it the very strong recommendation of private interest as well as of public utility.

Suppose a ship to be riding in an open bay or road-stead, a storm comes on, and if in winter, a long dark night is soon to follow.

In this situation the mariners being extremely doubtful whether the vessel could hold it out over the night, and terrified at the awful prospect of being thrown, as it were, blindfold into the most perilous of all situations, the determination would most undoubtedly be to cut and let the ship on shore while there was light, as giving the only chance for saving life.

The same determination may be taken in hopes of escaping by favor of a falling tide, and in both cases lives, ship and cargo may be all lost, as has certainly very frequently happened.

Whereas could safety be ultimately relied upon from the boat, the ship would be allowed to ride so long as anchors and cables could hold her, and in the mean time the storm abate, the wind might shift, or her tackling might prove sufficient to outride the storm, and thus lives, ship and cargo would all be safe.

In every situation the prospect of safety by means of the boat, would prevent every precipitate measure, and encourage men to make those exertions for saving ship and cargo, which are not to be expected from men despairing of life.

In the foregoing plans there is nothing that can be reckoned complex, nothing that requires nice adjustment, or of doubtful and precarious effect.

They are unquestionable in principle, simple and easy in execution, and absolute in security; and if the necessary previous preparation, which is very little, has been made,

they will be found as expeditious as any emergency can require.

They have been proved by experiment as far as circumstances would permit, and have received the unqualified approbation of naval men of the greatest experience, and of the first respectability.

These are the solid grounds upon which they are offered to the public in general, and most earnestly pressed upon the attention of seamen in particular.

The plan having been communicated to hundreds of seafaring men, they have always given it their ready and entire approbation; hence it is hoped, that every seaman from his own knowledge and experience, without any doubt whatever, will, upon considering the subject, be fully convinced in his own mind that the scheme is perfectly practicable, and if adopted, would be attended with the happiest effect.

Deeply impressed as I am with the importance of the subject, I shall be forgiven if I again repeat it, that shipwreck presents to our view distress heightened by every circumstance that can awaken sensibility, or excite commiseration.

To be exposed to the shock of overwhelming waves,—to contend long in one continued struggle for life,—to be bereft of every hope,—and given up to despair; constitute the deepest affliction in body and mind that human nature can undergo.

In this situation oft does the sufferer wish (which some who have narrowly escaped declare) to give up the painful contest; but nature refuses to resign, and keeps her hold so fast, that sometimes death itself has not been able to disengage it, for friends after death have been found fast locked together in each other's arms.

If

If this subject be considered in a political view, it must strike every mind, that the preservation of the lives of our seamen is united with that of our independence and very existence as a free nation.

Our seamen are the bulwark and palladium of our lives and liberties, and upon them alone, under God, depend all our greatness as a maritime power, and all our prosperity as a commercial people.

The ocean is their element, and every region from the vertical sun to the frozen pole is alike the scene of their diversified labours and manifold dangers.

Those necessaries, conveniences and comforts of life which nature has scattered widely throughout the terraqueous globe, they collect, transport and exchange, to the great benefit and general advantage of the human race.

It is to them that Britain stands indebted for the traffic of all nations, the wealth of both Indies, and the empire of the ocean.

The glorious victories they have lately achieved, and by which they have annihilated the navies of Europe—their skill—their courage—their fidelity, have justly merited all the applause, gratitude and rewards, that their country can bestow. Would it not then be culpable—would it not be criminal, to leave unattempted any means that have even the smallest probability of being useful in preserving the lives of so valuable and important a part of the community?

The regular plan which has been stated (to say the least of it) holds forth a very probable means of saving, annually, several hundreds of able and experienced seamen, and consequently would, in a very few years, furnish a reinforcement of thousands to our naval strength, and that too from a resource altogether new and unlooked-for, and at the same time without any trouble or expense.

Substitutes and Expedients which may be found useful.

1.—If so much cork was made up in canvas as would serve to go quite round the boat withoutside, and reach from the top of the gun-wales to about fifteen inches downwards, and of one foot in thickness; the same might be attached to the boat, and would render her extremely buoyant. This, together with ballast, and a small quantity of cork withinside, would render a perfect life-boat, upon almost the very same plan as the present life-boats.

The cork might be made up in so many separate parcels, (netted in small rope,) as was found convenient to be attached to a strong rope going round the gun-wale, and to another such which ought exactly to fit the girth of the boat where the cork reached to below.

As the cork would only press upwards, and always against the bottom and sides of the boat, it is evident that if the lower rope fitted tightly, the cork would keep its place; and in order to secure that point a few turns of rope passing from the lower edge on the one side over the keel to the lower edge on the other side would fix it completely. A very few seizings attached to the gun-wale rope passing from the one side to the other would be quite sufficient.

The separate parcels must be furnished with loops or ends for attaching them to the main ropes, and to one another.

2.—Several ring-bolts might be put into the keel withinside, and ropes, single, double or treble, might be passed through these rings before laying in the buoyant materials, and then these ropes might be brought round the whole contents and made fast.

3.—It frequently happens that seamen, after they have gained

gained the shore, find they have only escaped one death to perish by another still more miserable.

Drenched in water, chilled to the heart with cold, worn out with fatigue, and exposed to all the severity of inclement weather, without shelter or succour, it is impossible but that the remains of life must soon be extinguished.

In this situation, and it is far from being uncommon, dry clothing would be as precious as life itself, and it might be by the following expedient:—

Let a *leathern* bag be made for containing some shirts, a waistcoat or two, and two pair of drawers, all of flannel.

Let this bag be made of a length and size convenient for the purpose, and for tying round under the arm-pits.

This would serve the purpose of a cork-jacket in the water, and prove a second time as life from the dead, by affording dry and warm clothing upon gaining the shore.

By this expedient every man may be made a swimmer, and sometimes one man by swimming has been the means of saving the whole ship's company.

It may be proper to observe, that the larger part of the bag should be placed high upon the breast, and the other or back part no higher than the arm-pits, as in the act of swimming, the back part of the shoulders is little more than just covered with the water.

The bag must be perfectly water-tight, and only moderately filled; both ends of it may be left open to be closed with a tight seizing of small line.

The expense of this preparation would hardly cost five shillings.

4.—If it were intended only for swimming, a neat and commodious preparation might be made with cork covered with thin leather, to be applied in the manner which has just been described.

It might be fitted on with clothes or without in half a

minute, and made fast by a knot or clasp on the breast; three pounds of good cork would be sufficient to support any man, and the expense no more than in the former case.

5.—Another expedient bids fair for obtaining a speedy communication betwixt the ship and the shore, by means of a kite.

It is the property of this machine, to ascend in proportion as the cord is spared off.

To manage this, and to bring the line within reach on shore, let a piece of light wood, about the size of a small handspike, be attached to the line, about twelve fathoms from the kite; the line to be fixed to the forepart of the stick, and so as to pull only there, and then being slackly laid along the stick, made fast to the other end: by this means the kite would be prevented from rising higher, and would, at the same time bring the line to the shore from the ship, and by this small line a rope might be hauled from the ship by any spectator on the shore.

A silk-handkerchief, and a piece of wooden-hoop, might soon furnish a kite.

6.—Sometimes people are seen to perish, where those on shore, and those on the wreck, are almost within grasp of each other.

In this case, if there happened to be a mast standing, a common ensign made fast to a stick, just strong enough to keep it spread, and quickly spared off from the mast-head, would probably reach the shore without touching the water, or at least drift on shore with a small line attached to it.

No experiments having been made upon these substitutes and expedients, they are barely mentioned, as things that might possibly succeed, and are thrown out as hints for others to improve upon, after much consideration on my part.

Extract

Extract from the Transactions of the Royal Humane Society, and of the Highland Society's Transactions.

" The horror of actual or even of threatened shipwreck may in some degree be imagined, but it is impossible to convey adequate ideas of the feelings of those who are subjected to such direful calamities.

" That person therefore who, with unremitting perseverance and assiduity, prosecutes for years any scheme calculated to alleviate misfortunes so great, and which till of late were so little, as it was thought, within the power of human ingenuity to mitigate, merits well, not of his own country alone, but of all countries where navigation is known or practised. To such merit Mr. Bremner, a clergyman in a detached part of the British dominions, and thereby excluded in a great measure from the patronage of those in power, is well entitled; because it is obvious, that in prosecuting and making public his scheme, he has been actuated solely by his humanity, which has received this direction from the frequent instances he has witnessed of that dreadful calamity against which he attempts to provide.

" It would appear that, for several years Mr. Bremner had turned his attention towards devising some effectual method, for saving the lives of people in cases of shipwreck; but it was not, it is believed, till the year 1798, that he first submitted his scheme to the consideration of any of the public bodies in these kingdoms. In the month of October, 1800, he addressed a letter to the Highland Society of Scotland, inclosing a representation on the subject of his proposed scheme, and which he requested might be submitted to the consideration of the directors. In that letter Mr. Bremner states as follows:—' The plan has been amply approved

approved of, in its present form, by men whose experience and abilities cannot be questioned, viz.

" 1.—The Trinity House at Leith have entered the plan upon the records of their house.

" 2.—The Trinity House of London were pleased to give the following answer—" I am now to inform you, that your plans have been perused by the deputy-master and brethren, who are of opinion that the same might prove useful in cases of shipwreck, in preserving the lives of mariners, &c.

" Signed, JAMES COURT."

" 3.—Having transmitted a copy to the Royal Humane Society of London, with no other recommendation than a blank cover directed for their secretary, I had the honour to receive the following answer—" London, 6th May, 1800, I have only time to say, that the adjudicators of the Royal Humane Society, have unanimously voted their third pecuniary bounty to you, which is five guineas.

" Signed, W. HAWES."

" 4.—In addition to so respectable testimonies, I am able to produce nearly an hundred subscriptions of captains of merchantmen; all of whom, as well as the members of the foregoing societies, were to a man utterly unknown to me: their testimony must be considered as free from any bias, and the result only of the most mature deliberation and judgment.

" The accompanying representation having been laid before the directors, they appointed a Committee of their number, (among whom were some gentlemen well acquainted with naval affairs,) to take the same under consideration, and to report regarding the practicability and probable success of the plan therein described. The report of the Committee

Committee having proved favorable to the scheme, the directors requested the same Committee to order an experiment to be made in their presence at Leith, and to report the result.

" About this period (July 1800) Mr. Bremner, being in Edinburgh, undertook to prepare any ship's-boat in such manner that she would neither sink nor be overset; or, supposing it possible that the utmost fury of a wave might overturn her, that even in that case, the boat would in a few seconds recover herself, and return to her upright position with all that was in her; and in this state be able to support above water, the whole crew of the ship to which she belonged, and with regard to all merchantmen, even twice that number, if necessary.

" An ordinary ship's-boat, having been accordingly prepared by Mr. Bremner*, he did, by actual experiment, show in the Port of Leith, that his scheme was perfectly practicable, as, in order to bring it to the most severe trial

* A ship's boat of middling size was chosen by Mr. Bremner for the purpose, and prepared by the simple addition of two ring-bolts in the inside, and two augur-bores in the outside of the keel, as points of infallible security, to which seizing ropes were to be attached; the ring-bolts within-side the keel were placed, the one forward one-third from the stem, the other aft one-third from the stern: two empty hogsheads were then placed in the forepart of the boat, parallel and close to each other, and laid lengthways fore and aft. These were secured in their places by passing the seizing-ropes round all, that is, over the gunwales through the augur-bore in the keel; as also from the ring-bolt in the stem, to that next it in the keel; taking care in doing this to pass the rope through eyes on the slings of the casks, which had been previously prepared. The same process was observed in the after-part of the boat: and lastly, a bar of iron, of about three hundred weight, was fixed to the keel on the inside, A small quantity of cork was also placed in the stern, intended chiefly to raise to a proper height the casks placed above it; but without which the result of the experiment would have been the same.

that

that the situation would allow, and as near to the utmost trial it is possible to encounter at sea, the boat, by means of tackle, was forced over till her keel became uppermost, and perpendicular to the surface of the water; in this situation, and though full of water, the moment she was left to herself she instantly regained her position upright on the keel.

"This experiment having proved so satisfactory, the Committee reported to the directors as follows:—

"In the first place, that Mr. Bremner's contrivance differs from any life-boat of which they have received information, in so far as the latter being stationed at particular ports, are intended and calculated to afford occasional relief, in those cases of danger that may occur within their reach; and though very useful and proper in their invention, are yet thus limited in their use, while they are so constructed as not to be fit for the ordinary purposes of a boat, and on these accounts are neither proper nor convenient to be carried to sea on board a ship: whereas, on the other hand, Mr. Bremner's plan is of more general application, the object of it being a simple and expeditious method of converting every boat whatever, in all situations of danger, into a life-boat, so that at the same time that a boat retains all its common utility, it may be also easily resorted to as a safe-guard against danger, and in many cases, as the only possible means of escaping from death, otherwise inevitable; where life-boats, properly so called, as well as every other means of escape, are wanting.

"The preceding opinion is sufficiently warranted, in consequence of the successful result of an experiment, which, in conformity with the wish of the directors, was lately made at Leith, for proving the practicability of the plan; when, in the presence of the Committee, as well as many other

other members of the society, and a number of seafaring people, it was fully established that a boat, fitted up in the manner recommended by Mr. Bremner, would be extremely buoyant, even when filled with water, and not only almost incapable of being overset, but that if the utmost fury of the waves can overturn her, she will instantly return to her upright situation, or in sea language, right herself.

"Although this experiment was made with casks, yet the naval gentlemen present, entertained no doubt but cork should be preferred; and they were also of opinion, that the seizing or securing the apparatus, whether casks, or bundles of cork, might be done with great security, and if all be previously ready, (as it ought to be) with such expedition as to meet by far the greatest number of emergencies.

"In consequence of the preceding report, the directors presented Mr. Bremner with a piece of plate of the value of 15*l.* 15*s.* in testimony of their approbation of his scheme; and he having furnished a general description of his plan, and the same having been approved of by the Society and several naval men to whom it was referred, it is now laid before the public, in hopes that a plan, apparently so well calculated to afford relief in cases otherwise absolutely desperate, will meet due attention from all those who are in the way of being benefitted thereby."

From the obvious similarity there is betwixt the prepared ship-boat, and the common life-boat, some have been led to imagine, that the former has been borrowed from the latter.

This I can with truth affirm was by no means the case; and to prove it beyond all question, I can refer to the evidence of a nobleman now living, the Right Hon. Lord Melville, to whom, when treasurer of the navy, I sent the outline of my plan in the year 1792, a period at which no life-

life-boat existed, nor for several years afterwards; and the plan, detailed at more length, was transmitted afterwards by his lordship, to the Elder Brethren of the Trinity of London, for their opinion thereon; upon which I received the answer, under the hand of their secretary, as mentioned in the Highland Society's Report. From whence it appears that this was the first attempt that ever had been made upon any regular plan, to find a remedy for the manifold dangers and distresses to which seamen are exposed by shipwreck.

Whether my communications and correspondence so many years before may have given rise to the life-boats or not, is a question that probably never will be solved.

I however take the present opportunity of claiming the merit of having been the inventor of a most important improvement which has been made in the use of great guns, and which is now adopted throughout the whole of his majesty's navy.

Gun-Locks to Cannon.

This improvement consists in the application of a lock to every gun, by means of which the piece is discharged at the very instant it is found to point at its object.

The consequence is so obvious as to need no explanation to any who know the difference betwixt firing with an accurate aim, and firing at random.

Formerly one person pointed the gun whilst another stood ready, at the word fire, to clap a match to it; but in the interval, however short, the piece might have deviated a hundred yards void of the mark, and therefore scarcely differed any thing from firing at random.

The use of a lock completely remedies this defect; and it appearing to me very surprising that so easy and obvious an improvement had never been attended to, I took the opportunity

tunity, when in company with the late Sir Charles Douglas, at the house of Captain Moodie, of Melsetter, Orkney, in the year 1768, to remonstrate against the mode then used by matches, and to shew the very superior advantage to be gained by means of locks; pointing out, at the same time, how easily they might be adapted to the gun, and made to serve the same purpose as a lock does to a common musket. Sir Charles had the candour readily to acknowledge that he thought the plan was practicable, adding, that he certainly should have some experiments made to try it.

It is well known that Sir Charles Douglas was the first person who introduced them into the navy, and their advantage was soon found to be so great, that every ship was immediately furnished with them; our enemies too, convinced, to their cost, of their utility, have also adopted the same plan.

This however, though it has lessened the advantage on our part, has by no means balanced it, for so long as British seamen and the British navy retain their superiority—the former in spirit, activity and skill, and the latter in the number of guns and weight of metal—so long will the improvement by locks afford a very material advantage in favor of the British navy.

Another happy consequence that has followed from the use of locks is, that far fewer accidents happen now from explosions of loose powder than formerly, when so many matches were every where continually throwing out sparks, and setting fire to spilt powder, which, like so many trains, not only occasioned the loss of limbs and lives, but hazarded the blowing up of the ship and all that was in her.

If then the improvement made by the application of locks to great guns be duly appreciated in both these respects, it will be found to have been one of incalculable national benefit and advantage.

Every

Every man has a right to claim his property wheresoever found; and, by the proof required in such cases, I am ready to verify my right to this invention.

And as it has been, and may still be of great public advantage, I consider it as barely doing justice to myself, to claim the credit of it.

JAMES BREMNER.

Walls, Orkney, Sept. 16, 1809.

DEAR SIR,

I HAVE received your letters informing me that the Society of Arts, &c. had been pleased to vote me their Silver Medal and a Bounty of Twenty Guineas, as a reward for my plan, by which every ship-boat may occasionally be converted into a temporary life-boat.

I now, through you, beg leave to acknowledge with the greatest respect and the warmest gratitude, the high sense I feel, both of the Society's liberal bounty, and of the great honor they have conferred on me by their medal.

Such marks of approbation from a Society than which there exists none more respectable, must be highly gratifying to every person who has the honor to receive them, and to me in particular they are peculiarly so. Being above all things solicitous for the success of my plan, I am sensible that the sanction of the Society must prove a powerful recommendation, serving to attract attention and to promote its adoption.

By long laborious efforts my exertions had begun to flag, and my spirits had sunk greatly, but through the powerful incentives and encouragement from the Society, they have risen

risen again, and I feel a new impulse of vigour and animation to prosecute a plan which I am confident will prove successful at all times when tried.

Were I to attend in person, it would altogether defeat the end of the Society's bounty. My situation debars me that honor, and I regret it the more as I cannot have that opportunity of testifying to his Grace the President, and to the Society, the deep sense I have of the favor and honor they have done me, and to say that it will be a proud and pleasing recollection to me so long as I shall live, and that the credit of it will be a sure and lasting legacy to my family after me.

I trust that my remote distance will be my humble apology to the Society for my non-attendance, and that you will do me the favor to receive the Society's Rewards for me.

My local situation renders a communication with London very difficult and uncertain, whenever I can find a proper opportunity, I will direct some person to call upon you for the Society's Rewards, and I will endeavour to get a model of a boat fitted up on my plan, and sent to the Society.

I am, my dear Sir, your most obliged,

And most obedient Servant,

JAMES BREMNER.

Walls, Orkney, March 23, 1810.

To C. Taylor, M. D. Sec.

The SILVER MEDAL *of the Society was this Session voted to Mr.* SAMUEL HEMMAN, *of his Majesty's Dock-Yard at Chatham, for his Improved Mooring-Block for Ships. The following Communications were received from him. An Explanatory Engraving is annexed, and a Model of the Mooring-Block and Drawings are preserved in the Society's Repository.*

SIR,

I REQUEST that you will be pleased to lay before the Society for the Encouragement of Arts, &c. a drawing and model of a cast-iron mooring-block, invented by me for riding his Majesty's ships, and put in practice at this port. Also a drawing of a ship riding at moorings, with some observations thereon.

I am, Sir,

Your most obedient Servant,

SAMUEL HEMMAN.

Chatham Dock-Yard, Dec. 6, 1809.

To C. TAYLOR, M. D. SEC.

Account of Mr. Hemman's Cast-Iron Mooring-Block.

This mooring-block, from its construction and weight, is decidedly superior to any anchor whatever; similar blocks (No. 12,) have been appropriated to that service at this port since the year 1801, by the Directors of the Honorable Navy Board, and in no one instance have ever been displaced,

placed, notwithstanding we have had very severe weather since that time. As a proof of their holding fast in the ground, I shall adduce the following circumstance to prove the assertion:—It was found requisite to remove one of those mooring-blocks; two large lighters with purchases in each, adapted for that purpose, with about forty-five men, were sent to weigh it, but their united powers were not adequate to the task; recourse was then had to the rising of the tide to dislodge it. The largest anchors appropriated to the moorings for a ship of the line are from sixty-five to eighty cwt. and those sizes are found insufficient at times, whereas the weight of a mooring-block is about one hundred and fifty cwt. which is sixty cwt. heavier than a first-rate's anchor, besides a form better calculated to hold in addition to its increased weight; this double advantage will allow a reduction from the length of the chain, which is very expensive; and in one pair of moorings for a ship of the line a saving of about 874 *l.* will arise out of 2472 *l.* the present expense of a pair of moorings with anchors. There is another advantage by adopting these blocks, viz.—there are no anchors appropriated to moorings but might be made serviceable; and should there be no defective anchors in store, we are necessitated to take sound ones.—I must further observe, that there is no species of stores in his Majesty's navy that is so difficult to procure as large anchors, owing to the want of anchor-smiths; and moreover an anchor of seventy-six cwt. will take upwards of thirty days to make it, whereas a mooring-block may be cast in as many hours; besides, there are but few smitheries competent to make large anchors, except in his Majesty's dock-yards; but a mooring-block can be procured at all the iron-foundries in the kingdom.—These are circumstances of the highest importance.

I was induced to try an experiment of laying down a pair of moorings of this description, from the necessity of mooring a ship in a situation where there was not room for her to swing, provided the bridles attached to the moorings came in at the hawser-holes, which is usual.

Accordingly I laid down a pair, and moored the Maidstone frigate at them; she has been there about four months, and I find those moorings answer the desired purpose. The ship turns with the wind or tide occasionally.

The bridles come in at the fourth port from forwards on each side the swivel (as shown in the plate) under her bottom; this gives facility to the ship, and keeps the ground-chain clear. Moorings of this description will answer for ships of all sizes, provided there is a sufficient depth of water under them.

SAMUEL HEMMAN.

GENTLEMEN,

We direct you to let us know if you see any and what objections to eighteen anchors, of not less than sixty-seven hundred weight, being taken from the moorings at your port, when the season of the year and other circumstances will admit, for the use of the moorings, which are to be laid down at Sheerness for line-of-battle ships, provided mooring-blocks are furnished for your port, in lieu of the said anchors.

We are, &c.

H. PEAKE,
J. D. THOMPSON,
J. SHOMBERG.

Navy-Office, Nov. 9, 1809.

To the Chatham Officers.

CERTIFICATES.

CERTIFICATES.

These are to certify, that his Majesty's ship Maidstone has been placed at the Weathercock-moorings, within the entrance of St. Mary's creek; that I have resided on board of her since the moorings were laid down, which was in June last, and that they answer extremely well.

And I do further certify, that many of the line-of battle ships in my division are moored with Mr. Hemman's cast-iron mooring-blocks; that they ride in perfect safety, and in my opinion are superior to any anchor whatever: moreover the service derives great benefit from them.

Given under my hand this 13th day of November, 1809.

A. SHENNAN,

Superintending-Master of the First Division.

This is to certify, that Mr. Samuel Hemman, the master attendant at this port, has moored a number of his Majesty's large ships in the river Medway with cast-iron blocks instead of anchors; that all these ships ride perfectly safe, and I strongly recommend the use of them in preference to anchors.

G. JOHNSON,

Boatswain and Pilot of his Majesty's Ships at the Port of Chatham for many years.

Reference to the Engraving of Mr. Samuel Hemman's Mooring-Block for Ships, Figs. 3, 4 and 5, Pl. 5.

Fig. 3 is a perspective view, wherein A A is the stock made of two beams united together by hoops, and by that means fastened round the shank B of cast-iron; C C C is the fluke, made as in the figure, of such a form as to take the greatest hold in the ground, its lower edge being sharp but the full width, so that it has an edge but no point. D is the swivel which connects the shank to the mooring-chain. E is a part of the shank projecting through the fluke, having a hole through it to receive a buoy-rope to take up the anchor when necessary. This mooring-block weighs one hundred and fifty cwt. the principle part of which is situated in the fluke, the edge of which is thereby forced into the ground so as to take good hold.

Fig. 4 and 5 explain Mr. Hemman's method of mooring a large ship in confined situations, where there is not sufficient room for her to swing if the bridles came in at the hawse-holes in the usual manner of mooring.

Near A, fig. 4, is the hawse-hole of the vessel where the bridles of the mooring-chain are generally brought in. C are the bridles in the improved method. D are wooden bolsters projecting from the ship's sides so far as too keep the two hawsers E clear of their bottom, as shewn in fig. 5; these hawsers are united in the swivel F, and this with the mooring-chains G G, which proceed to two blocks, similar to fig. 3, one of which is shewn at H, the opposite one does not come within the limits of the plate. I is supposed to be the line of low water, and K the surface of the ground.

FIFTY GUINEAS *were this Session voted to Mr.* JOHN DAVIS, *No. 7, John-street, Spitalfields, for a Method of assisting the escape of Persons, and the removal of Property, from Houses on Fire. The following Communication was received from him. An explanatory Engraving is annexed, and a complete Model of the Machine is preserved in the Society's Repository.*

SIR,

I BEG you will have the goodness to lay before the Society of Arts, &c. a machine which I have invented for more effectually saving persons and property from fire.

It appearing to me a desirable object that the public should be in possession of an apparatus better adapted for the above purpose than any now in use, I have endeavoured to strike out an entire new plan of a machine calculated for the use of a parish, which can be easily removed and adjusted to any window, with a convenient apparatus or box, moveable up or down, so as to receive persons or property. I have completed such a machine, which has answered my expectations, and been approved by several gentlemen who have seen it in action.

The machine is at Mr. James Bevan's mahogany-yard, City-road, where it shall be exhibited to a Committee appointed by the Society whenever they please.

I am, Sir,

Your obedient humble Servant,

JOHN DAVIS.

No. 7, John-street, Spitalfields, Jan. 10, 1809.

To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. John Davis's Fire-Escape, Pl. 6.

The plan of my fire-escape is calculated for the use of a parish; its principal consists in three ladders A B C applied to each other by four clasp irons on the top of each of the two lowermost, which are so contrived that each ladder may slide into the one beneath it; on the top of the lowermost ladder A two pullies are fixed on the inside, over which two ropes *a a* pass, and are situated between the lower A, and the middle one B. The ropes are made fast to the bottom of the middle one on each side in a proper direction with the pullies on the top. The upper ladder C is attached to the middle one in the same manner, and on the top it carries two horn-pieces D, made of iron, and turned off at each end similar to two horns which are four feet wide; their ends are sharp, to pitch on each side of a window, and with its points hold the ladders steady. The three ladders when shut down are about fifteen feet in height. They are placed perpendicular in the middle of a framed carriage E F of nine feet six inches long, and five feet six inches wide, mounted upon four wheels F. On each side of the carriage a windlass is placed; that marked G on the right side of the carriage is for the four ropes *a a* and *b b*, fixed two to each ladder A B. By turning this windlass the ladders may be wound out from their standing height of fifteen feet to forty. Over this windlass is a screw turned by the winch *d*, by turning which the ladders may be inclined against the house with all imaginable ease. On the top of the upper ladder C on the outside, are two pullies, over which two chains are conducted to the windlass H on the left side for the purpose of carrying up a box I; two of which

which travel with the fire-escape, so that in the event of one being filled with small valuables, it may be unhooked, and the other K put on, which will save time. The whole apparatus may be drawn by one horse or six men, and when arrived at the scene of danger may be adjusted in two minutes. If every parish would provide one of these escapes, and keep it where it might be brought out on the first alarm, I feel persuaded it would lessen the many accidents which occur by fire in the metropolis.

I have the honor to be, Sir,

Your obedient humble Servant,

JOHN DAVIS.

No. 7, John-street, Spitalfields, May 14, 1810.

To C. Taylor, M. D. Sec.

Further Observations from Mr. Davis on his Fire-Escape.

SIR,

I beg leave to return you, and the gentlemen of the Committee, my sincere thanks, for the kind attention I have experienced; and should you think the following hints likely to give any additional information on the subject of my fire-escape, you will have the goodness to submit them to the consideration of the Committee.

Certain it is, that however good any principle may be, the practice must also be so to be effectual, therefore it is my opinion, that every parish should be provided with a machine on my principle, to be kept in some convenient place, easy of access. The key should be kept at the watch-house by night, and by day at the nearest public-house; if

if this, which ought to be, were the uniform custom, it would soon become familiar, and be attended with no expense. On the alarm of fire, I would have the machine brought out directly, as I consider it an improvident method when a house has been on fire some time, and some unfortunate sufferer should appear in need of prompt assistance, to have to search about for the keys of a church-yard, or some other obscure place, to bring the fire-ladders, which when brought, if not exactly the right height, are useless, and when this which is not unfrequent, is the case, the remedy is almost as bad as the disease, witness Mrs. Smith, having fallen off a parish ladder, at Chelmsford, whilst endeavouring to save herself in that dreadful fire in March, 1808. It would be needless for me to enumerate instances, where a well-timed outward apparatus would have been of essential service—the thing is self-evident, and the occasions for their use have also been many. I would also propose that a board should be put up, offering a reward sufficient to stimulate persons to bring the machine—for example, ten pound for every life saved by it. I think no person would think it too much, who had been saved. This would have the good effect of having it always in time, which is most essential, as twenty-shillings are not sufficient to induce men to the necessary trouble attending such labour.

Having thus offered my sentiments, respecting the good effects which may be derived were certain regulations put in force,

I remain, with great feeling for suffering humanity,

Sir,

Your most obedient and humble Servant,

JOHN DAVIS.

To C. Taylor, M. D. Sec.

Mr. I. Davis's Fire Escape.

J. Fray Esq.

Fraser

The GOLD MEDAL *of the Society was this Session voted to Mr.* J. ALLAN, *of Blewit's Buildings, Fetter Lane, for his Improvements in a Mathematical Dividing Engine. The following Communications were received from him. An explanatory Engraving is annexed, and a Model of the Improvement is preserved in the Society's Repository.*

SIR,

I BEG leave to send to you, herewith, for the inspection of the Society of Arts, &c. a model of my improvement on the mathematical dividing engine, which I have lately made, containing that part which differs in principle from those made by the late Mr. Ramsden and others; the drawings or engravings of which are, I suppose, in the Society's possession. I therefore am of opinion the Society will think that the wooden-wheel I have sent with the moveable ring on its edge, will be sufficient to demonstrate its good effect in correcting the teeth or rack where the screw acts. You will please to observe, that it is cut by a screw-cutter, and it is required to go many times round the engine before the teeth are full. To effect this, I reversed the moveable ring not less than twenty times, so that I have not the least doubt of the one ring having corrected the other to a degree of perfection, which had not hitherto been obtained in engines.

This simple, easy, and correct way of making engines, may be applied with great advantage to circular instruments, for

for the purposes of astronomy and land-surveying. If the Society will do me the honor to appoint a Committee to view the engine itself, I will demonstrate its effects.

I am, Sir,

Your very humble Servant,

JAMES ALLAN,

Divider of Mathematical Instruments.

No. 12, *Blewit's Buildings,*
Fetter Lane, Nov. 20, 1809.

To C. Taylor, M. D. Sec.

Mr. Allan's Description of his Mathematical Dividing Engine, and his Method of forming it.

My engine is of bell-metal, thirty inches in diameter. I turned a brass ring about three-sixteenths of an inch thick, and fitted in on the underside of the above bell-metal wheel, which I made fast by twenty-four rivets; I then fixed in the axis, and turned the wheel and ring together on the lathe, as near as possible to the required shape on its own axis. This being done, and having mounted it on its own stand, where it now acts, I fixed a tool, with an adjustment to turn the edge of the bell-metal wheel where the uppermost or moveable ring of the same thickness as the other is fitted on; for if the circle, where the moveable ring fits the bell-metal, is not turned as true as possible, (which cannot be done properly by any other means than by a fixed tool) the moveable ring will not reverse correctly. When this was done, I fitted on the moveable ring. I then divided the lower under ring into twenty-four parts, for the screws which keep the rings together. I also divided it into four parts for the steady pins;

pins; the holes of which I made by an upright drill fixed and adjusted for the purpose. I then cut two opposite divisions, in order to reverse the uppermost ring correctly, which were my guide in broaching for my steady pins, and which I did with a broach to a stop fixed on it. In broaching I reversed the moveable ring many times, taking care at the same time that my opposite divisions were correct.

My first idea was to have two wheels or circles, acting on the same centre, so as to constitute a double edge, to afford me an opportunity to reverse in the act of cutting the rack or teeth; but I thought the method in which I have done it would with care be equally correct. Either of the methods come to the same point, and I preferred the way I have employed, thinking it the least expensive. By this self-correcting method, instruments may be made for astronomical purposes, racked and divided on their own centre, and if carefully done would border on perfection itself, consequently I consider it to be the greatest improvement ever made in the art of dividing. I call it self-correcting, because every time it is reversed in cutting the teeth, the screw has a fresh opportunity to correct errors insensible to the eye.

I have well considered the subject, and think that a circle of twelve inches diameter, made on this principle, would measure angles equally, if not more accurately than astronomical instruments divided by engines, or by any other methods hitherto used by instruments of any size. It is, therefore, my opinion, that the supposed necessity of making very large circles, for the sake of obtaining correct divisions, will be done away.

JAMES ALLAN.

CERTIFICATES.

CERTIFICATES.

After a close consideration of Mr. Allan's improvement in dividing engines, (I mean his mode of racking the teeth only) when combined with the methods at this time known and practised, I look upon it as an important discovery; it is a plan that in my opinion will admit of a great degree of accuracy, approaching nearly to perfection itself, particularly in circles of small radius, but not quite so applicable in large machines for the purpose of dividing.

JOHN STANCLIFFE.

Little Mary-le-Bone Street,
Dec. 15, 1809.

SIR,

THE method you have taken to produce a perfect equal racking, for the constructing an accurate dividing engine, is the greatest advance towards perfection that has been communicated to the public within my knowledge, and I believe it to be a method never before practised in this country. It is applicable to the construction of machines of any dimensions, that mathematical or nautical instruments can be graduated by.

It is my belief, that the greater number of the machines now in use, are far short of the perfection they are reputed to have.

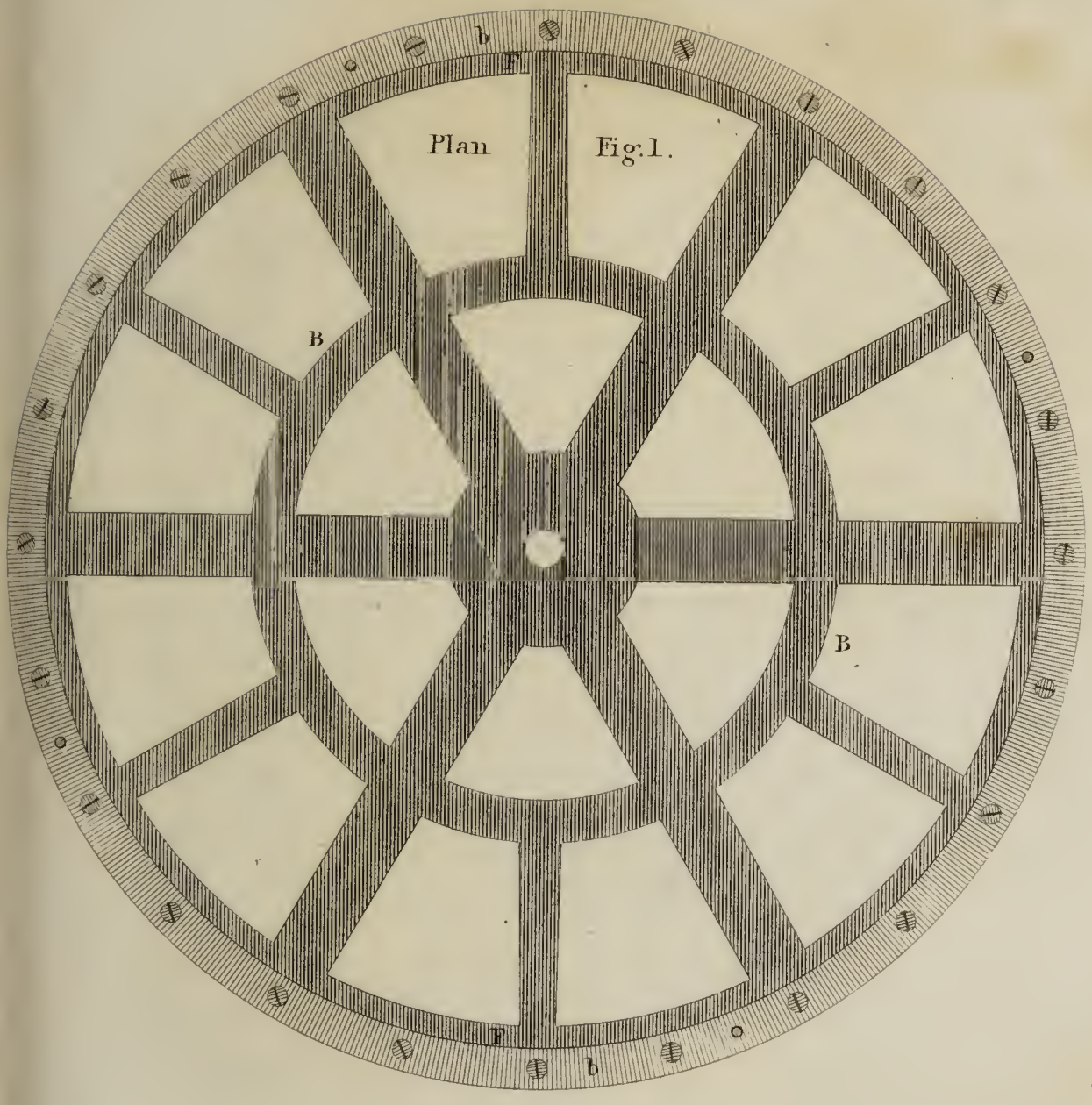
I am, Sir,

Your humble Servant,

M. BERGE.

Piccadilly, Jan. 8, 1810.
Mr. J. ALLAN.

Reference



Mr. Allan's Mathematical Dividing Engine.

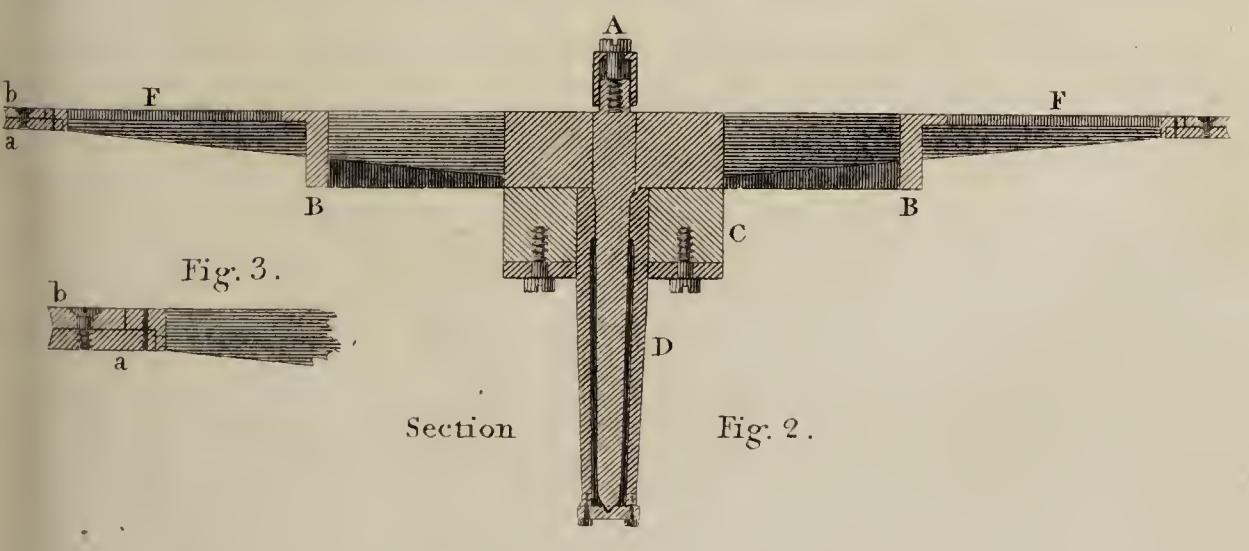


Fig. 3.

Section Fig. 2.

Scale of Inches.

Engraved by S. Porter

Reference to the Drawing of Mr. Allan's improvement on the Dividing Engine of Ramsden, Pl. 7.

The dividing engine invented by Mr. Jesse Ramsden, and for which he received the reward of the Board of Longitude, in the year 1775, is minutely explained in a quarto pamphlet, published by order of the Commissioners of Longitude; also, in the article *engine*, in Dr. Rees's New Cyclopædia, as well as some other works of a similar nature; it therefore becomes unnecessary for the Society to give any more of Mr. Allan's engine in their drawings than is explanatory of the improvement, the engine being used in the same manner as Ramsden's; this part is the great circle upon which the arch to be divided is placed, and the circle turned about a determinate quantity at each division, by means of a screw whose threads engage fine teeth, cut around the periphery of the circle. The improvement by Mr. Allan consists in the method of cutting or racking these teeth, to ensure their being perfectly of equal size, in all parts of the circle.

The plan, fig. 1. in plate 7, represents the upper surface of a bell-metal circle mounted upon an axis, A, fig. 2. and its surface made truly plane, and perpendicular to the axis; the section shews the figure of the axis, and the central ring B, to give the greatest strength to the circle; C is a section of a portion of the frame of the engine; and D a socket into which the axis A is fitted; the circumference of the large circle is turned to such a figure as to receive a ring of brass, *a*, fig. 3. which is united firmly to it by a number of pins, one of which is shewn in the figure. Upon this ring, a second *b* is placed, the two making the same thickness as the circle. The inside of the ring *b*, and the outside of the bell-metal

metal circle, are fitted to each other with the utmost accuracy, and great care taken to turn the said truly fitting concentric with the axis of the circle; the brass rings *a* and *b* are held together by twenty-four screws, as shewn in the plan; and a groove, corresponding to the curvature of the screw which moves the circle, is turned in the outside of the two; in this state the racking of the teeth is performed by a screw similar to that afterwards used to turn the circle to its divisions, but notched across the threads so that it cuts like a saw, when pressed against the circle and turned round, and removes the metal from the spaces between the teeth, which are by this means formed around the edge of the circle; when this has been performed all round, two fine lines are drawn across the brass and bell-metal circles, diametrically opposite each other; the twenty-four screws are then withdrawn, and the upper brass ring turned exactly half round, which is determined by the lines before-mentioned; and by this means the teeth of the circle are divided into two thicknesses, and being put together again in opposite directions, if any error arose in racking the teeth, it would be shewn by the upper and lower halves of the teeth, not coinciding when reversed, and by racking them while reversed the screw would cut away the inequalities, and make all the teeth of the same size and distance from each other; this reversing the teeth is performed several times, till the teeth are brought to a perfect equality in all parts of the circle; four steady pins are accurately fitted into the two rings to hold them together in any of the positions in which they have been racked together, and it is upon these the dependence is placed for the co-incidence of the teeth, the twenty-four screws being merely to hold them fast together, and fitted rather loosely in their holes, that they may not strain the steady pins.

The

The GOLD MEDAL *of the Society was this Session voted to Mr.* BRYAN DONKIN, *of Fort Place, Bermondsey, for an Instrument to ascertain the Velocities of Machinery, called by him a Tachometer. The following Communication was received from him. An explanatory Engraving is annexed, and a complete Machine and a Drawing is preserved in the Society's Repository.*

SIR,

I BEG leave, through your means, to lay before the Society of Arts, &c. an instrument of my invention, for indicating the velocity of machines, and which may not improperly be called a Tachometer. You will at the same time receive a drawing, with an account of the instrument, and the mode of its application.

I am, Sir, most respectfully,

Your obedient humble Servant,

BRYAN DONKIN.

Fort Place, Bermondsey,
April 11, 1810.

To C. TAYLOR, M. D. SEC.

Reference

Reference to, and Description of, Mr. Donkin's Tachometer, or Instrument for indicating the Velocity of Machinery, Pl. 8.

In the employment of machinery it is evidently of great importance to be provided with an easy and ready method for discovering at all times whether the motion of the machine is quicker or slower than what is known to be best adapted for the object in view. This advantage, it is hoped, may be derived from the Tachometer, for it is an instrument which requires only to be adjusted once for all, to any particular machine, and then it will always be ready without the help of calculation or of a time-piece, to indicate instantly upon inspection the slightest excess or defect in the actual velocity.

A front view of the Tachometer is represented in fig. 1, and a side view in fig. 2, of plate 8. X Y Z, fig. 1, is the vertical section of a wooden cup, made of box, which is drawn in elevation at X, fig. 2. The whiter parts of the section, in fig. 1, represent what is solid, and the dark parts what is hollow. This cup is filled with mercury up to the level L L, fig. 1. Into the mercury is immersed the lower part of the upright glass tube A B, which is filled with coloured spirits of wine, and open at both ends, so that some of the mercury in the cup enters at the lower orifice, and when every thing is at rest, supports a long column of spirits, as represented in the figure. The bottom of the cup is fastened by a screw to a short vertical spindle D, so that when the spindle is whirled round, the cup, (whose figure is a solid of revolution) revolves at the same time round its axis, which coincides with that of the spindle.

In consequence of this rotation, the mercury in the cup acquires a centrifugal force, by which its particles are thrown outwards,

outwards, and that with the greater intensity, according as they are more distant from the axis, and according as the angular velocity is greater. Hence, on account of its fluidity, the mercury rises higher and higher as it recedes from the axis, and consequently sinks in the middle of the cup; this elevation at the sides and consequent depression in the middle increasing always with the velocity of rotation. Now the mercury in the tube, though it does not revolve with the cup, cannot continue higher than the mercury immediately surrounding it, nor indeed so high, on account of the superincumbent column of spirits. Thus the mercury in the tube will sink, and consequently the spirits also; but as that part of the tube which is within the cup is much wider than the part above it, the depression of the spirits will be much greater than that of the mercury, being in the same proportion in which the square of the larger diameter exceeds the square of the smaller.

Let us now suppose, that by means of a cord passing round a small pulley F, and the wheel G, or H, or in any other convenient way; the spindle D is connected with the machine whose velocity is to be ascertained. In forming this connection, we must be careful to arrange matters so, that when the machine is moving at its quickest rate, the angular velocity of the cup shall not be so great as to depress the spirits below C into the wider part of the tube. We are also, as in the figure, to have a scale of inches and tenths applied to A C, the upper and narrower part of the tube, the numeration being carried downwards from zero, which is to be placed at the point to which the column of spirits rises when the cup is at rest.

Then the instrument will be adjusted, if we mark on the scale the point to which the column of spirits is depressed, when the machine is moving with the velocity required.

But, as in many cases, and particularly in steam-engines, there is a continued oscillation of velocity, in those cases we have to note the two points between which the column oscillates during the most advantageous movement of the machine.

Here it is proper to observe, that the height of the column of spirits will vary with the temperature, when other circumstances are the same. On this account the scale ought to be moveable, so that by slipping it upwards or downwards, the zero may be placed at the point to which the column reaches when the cup is at rest; and thus the instrument may be adjusted to the particular temperature with the utmost facility, and with sufficient precision. The essential parts of the Tachometer have now been mentioned, as well as the method of adjustment; but certain circumstances remain to be stated.

The form of the cup is adapted to render a smaller quantity of mercury sufficient, than what must have been employed either with a cylindrical or hemispherical vessel. In every case two precautions are necessary to be observed:—First, That when the cup is revolving with its greatest velocity, the mercury in the middle shall not sink so low as to allow any of the spirits in the tube to escape from the lower orifice, and that the mercury, when most distant from the axis, shall not be thrown out of the cup. Secondly, That when the cup is at rest, the mercury shall rise so high above the lower end of the tube, that it may support a column of spirits of the proper length.

Now in order that the quantity of mercury, consistent with these conditions, may be reduced to its minimum, it is necessary—first, that if M M, fig. 1, is the level of the mercury at the axis when the cup is revolving with the greatest velocity, the upper part M M X Y of the cup should be of such

Mr. Donkin's Tachometer.

Fig. 1.

Fig. 2.

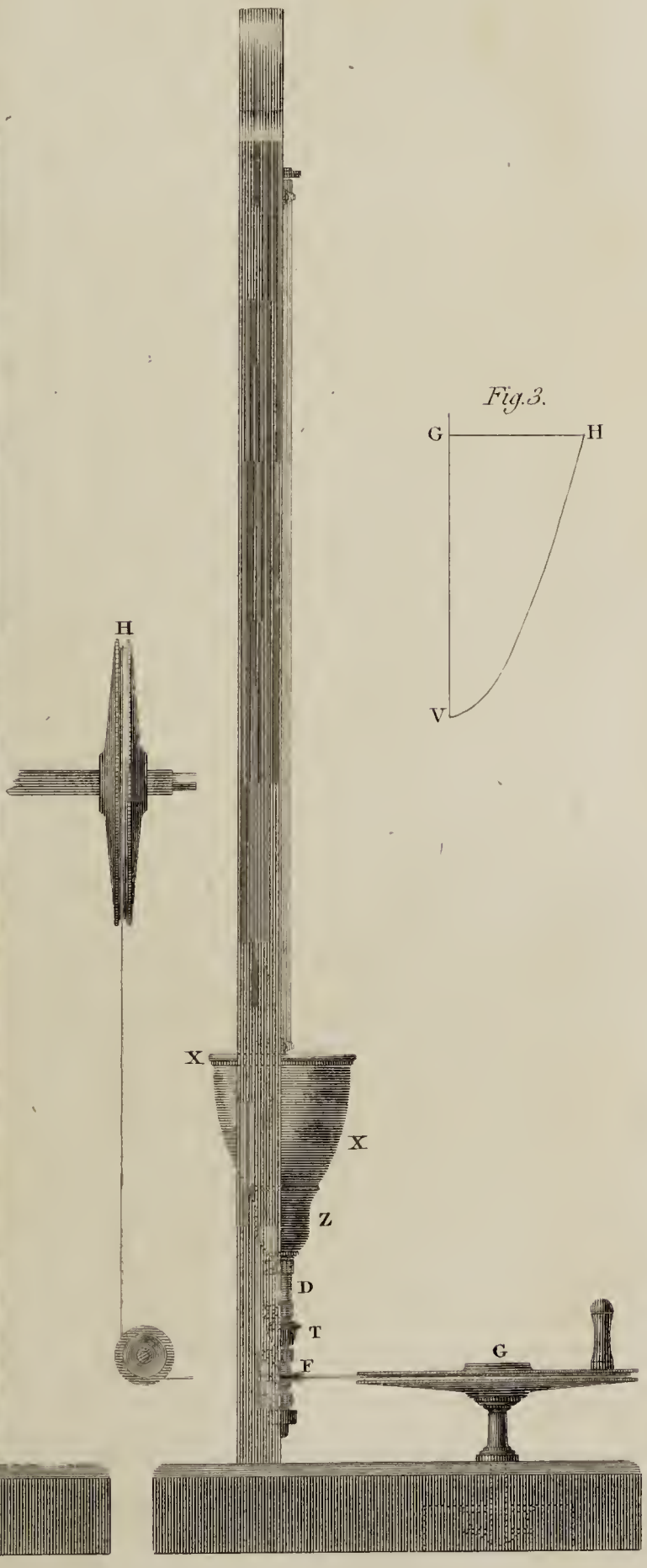


Fig. 3.

by J. Farey Jun.r

Engraved by S. Porter

such a form as to have the sides covered only with a thin film of the fluid; and secondly, that for the purpose of raising the small quantity of mercury to the level L L, which may support a proper height of spirits when the cup is at rest; the cavity of the cup should be in a great measure occupied by the block K K, having a cylindrical perforation in the middle of it for the immersion of the tube, and leaving sufficient room within and around it for the mercury to move freely both along the sides of the tube and of the vessel.

The block K K is preserved in its proper position in the cup or vessel X Y Z, by means of three narrow projecting slips or ribs placed at equal distances round it, and is kept from rising or floating upon the mercury by two or three small iron or steel pins inserted into the underside of the cover, near the aperture through which the tube passes.

It would be extremely difficult, however, nor is it by any means important, to give to the cup the exact form which would reduce the quantity of mercury to its minimum; but we shall have a sufficient approximation, which may be executed with great precision, if the part of the cup above M M is made a parabolic conoid, the vertex of the generating parabola being at that point of the axis to which the mercury sinks at its lowest depression, and the dimensions of the parabola being determined in the following manner:— Let V G, fig. 3, represent the axis of the cup, and V the point, to which the mercury sinks at its lowest depression; at any point G above V, draw G H perpendicular to V G; let n be the number of revolutions which the cup is to perform in 1″ at its quickest motion; let v be the number of inches which a body would describe uniformly in 1″, with the velocity acquired in falling from rest, through a height $= $ to G V, and make G H $= \frac{v}{3\ 14\ n}$. Then, the parabola

to be determined is that which has v for its vertex, V G for its axis, and G H for its ordinate at G. The cup has a lid to prevent the mercury from being thrown out of it, an event which would take place with a very moderate velocity of rotation, unless the sides were raised to an inconvenient height; but the lid, by obstructing the elevation at the sides of the cup, will diminish the depression in the middle, and consequently the depression of spirits in the tube: on this account a cavity is formed in the block immediately above the level L L, where the mercury stands when the cup is at rest; and thus a receptacle is given to the fluid which would otherwise disturb the centrifugal force, and impair the sensibility of the instrument.

It will be observed, that the lower orifice of the tube is turned upwards. By this means, after the tube has been filled with spirits by suction, and its upper orifice stopped with the finger, it may easily be conveyed to the cup and immersed in the quicksilver without any danger of the spirits escaping, a circumstance which otherwise it would be extremely difficult to prevent, since no part of the tube can be made capillary, consistently with that free passage to the fluids, which is essentially necessary to the operation of the instrument.

We have next to attend to the method of putting the Tachometer in motion whenever we wish to examine the velocity of the machine. The pulley F, which is continually whirling during the motion of the machine, has no connection whatever with the cup, so long as the lever Q R is left to itself. But when this lever is raised, the hollow cone T, which is attached to the pulley and whirls along with it, is also raised, and embracing a solid cone on the spindle of the cup, communicates the rotation by friction. When our ob-

servation

servation is made, we have only to allow the lever to drop by its own weight, and the two cones will be disengaged, and the cup remain at rest.

The lever Q R is connected by a vertical rod to another lever S, having, at the extremity S a valve, which, when the lever Q R is raised, and the Tachometer is in motion, is lifted up from the top of the tube, so as to admit the external air upon the depression of the spirits; on the other hand, when the lever Q R falls, and the cup is at rest; the valve at S closes the tube and prevents the spirits from being wasted by evaporation.

It is lastly to be remarked, that both the sensibility and the range of the instrument may be infinitely increased; for, on the one hand, by enlarging the proportion between the diameters of the wide and narrow parts of the tube, we enlarge in a much higher proportion the extent of scale corresponding to any given variation of velocity; and on the other hand, by deepening the cup so as to admit when it is at rest a greater height of mercury above the lower end of the tube, we lengthen the column of spirits which the mercury can support, and consequently enlarge the velocity, which, with any given sensibility of the instrument, is requisite to depress the spirits to the bottom of the scale. Hence the Tachometer is capable of being employed in very delicate philosophical experiments, more especially as a scale might be applied to it, indicating equal increments of velocity. But in the present account it is merely intended to state how it may be adapted to detect in machinery every deviation from the most advantageous movement.

THIRTY GUINEAS *were this Session voted to Mr.* LEWIS AUBREY, *of Fort-place, Bermondsey, for Implements for equalizing the Width and Thickness of Leather Straps. The following Communication was received from him. An Explanatory Engraving is annexed, and the Implements are preserved in the Society's Repository.*

GENTLEMEN,

HAVING contrived two implements for equalizing the breadth and thickness of leather straps, which will be found of the greatest utility to sadlers, harness and collar-makers, leather-cutters, and others, I take the liberty most respectfully to offer them to you, hoping they will be found to merit your approbation and reward, which will be most grateful to,

Gentlemen,

Your most obedient humble Servant,

LEWIS AUBREY.

Fort place, Bermondsey,
Nov. 22, 1809.

To the Society of Arts, &c.

CERTIFICATES were received from the following persons, addressed to Mr. Aubrey, dated in March last.

From Mr. W. B. BROWN, of Two Waters Mill, stating that it is with much pleasure he has it in his power to bear full testimony

testimony to the superiority of the deakle straps cut by his process, as they combine those indispensable qualities of regularity in thickness and breadth, so particularly requisite for their purpose.

From Mr. JOHN BUTTONSHAW, of West Peckham, Kent, stating, that the deakle-straps and wire-straps used in his machine for manufacturing paper, are made perfectly smooth and true, and much superior to any he can get made either at the shoe or collar-makers, or any other workers of leather, and that he buys them of Mr. Donkin, Fort-place, Bermondsey.

From Mr. JAMES SWANN, of Ensham-mills, near Oxford, stating, that in answer to Mr. Aubrey's letter, he can readily certify, that the straps lately supplied by Mr. Donkin, and which are made with tools of Mr. Aubrey's invention, are found to be superior in point of evenness, width, and thickness, to any he ever procured before, and which have induced him a few days ago to order a further supply of them.

From Mr. RICHARD ELLIOT, of Chesham, stating, that at Mr. Aubrey's request, he would say what he knew from practice, respecting the leather cut by his machine; that they are the best he ever had, and are cut as correct as possible, both in thickness and width, and answer much better than any cut in the common way.

Reference to the Engraving of Mr. Aubrey's Machines for cutting Leather Straps, Plate 9.

Figs. 1, 2, and 3, are a plan, section, and end-view of the instrument for cutting leather-straps to an equal thickness. A is the knife fixed to the frame by two screws *a a*, which pass

pass through holes in the end of the knife, and have two nuts upon each of them, between which is fastened the knife, and by means of these the knife can be raised or lowered, and fixed at any point, by screwing the nuts towards each other: *b*, fig. 3, is the lower, and *c* the upper one, which fastens the knife upon the other; the screws *a a* are fastened to the frame by two plates and four screws at *d*, *d*, *d*, *d*, which fit into oblong holes in the plates, and can be loosened to put the knife nearer to, or further from a roller B, between which, and another roller D, fig. 2, (concealed in the wooden frame,) the leather-strap passes; the bearing *e e* for the pivots of the upper roller are screws, and received into tubes E, E, figs. 1, 2, and 3, which are also screwed internally, so that, by turning these tubes round, the roller is brought nearer to, or further from the roller D, to suit straps of different thicknesses; the tubes are also drawn down by helical-springs (concealed in the wood,) which keep the upper roller down with a moderate pressure, but at the same time allow it to rise up, if a thick part of the strap comes under it. F F are two handles fixed to the mahogany-block, which is the frame for the whole. G is a rod or wire bent at right-angles at each end, and driven into the block with two sliding pieces *g g* upon it, which can be fixed at any distance from each other by screws; these are set to the width of the strap, to keep it parallel in passing through the rollers B and D; it enters in between them, passing under the knife A, and over the inclined part *h*, fig. 2, the end which is just through is fastened to the work bench, and the workman takes the machine by its handles F F, and draws it back from the bench, this pulls the strap through between the rollers, and the knife removes all the leather which projects above its edge, leaving the strap of a perfectly equal thickness throughout; this thickness is,

Mr. Aubreys Instruments for cutting Leather Straps.

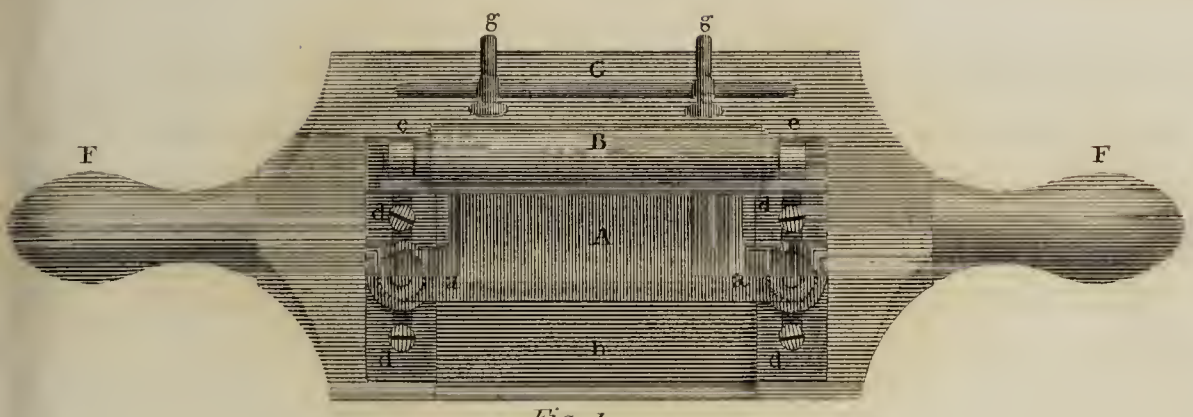


Fig. 1.

Fig. 2.

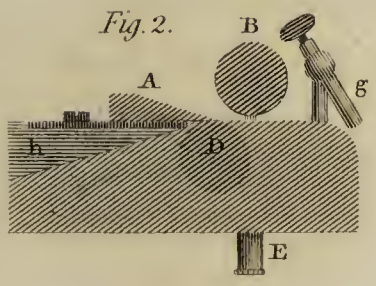
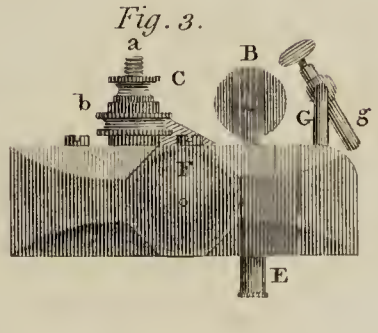
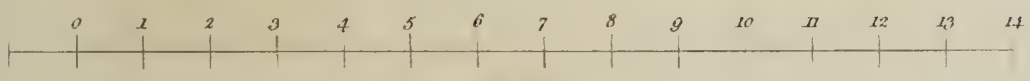


Fig. 3.





Scale of Inches.

Fig. 4.

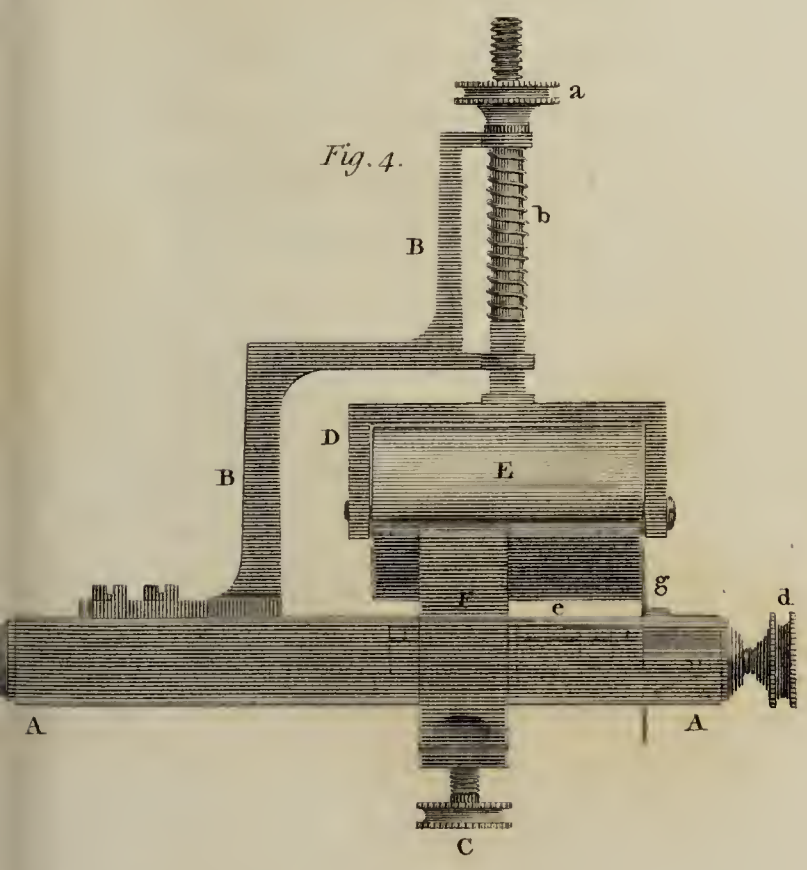
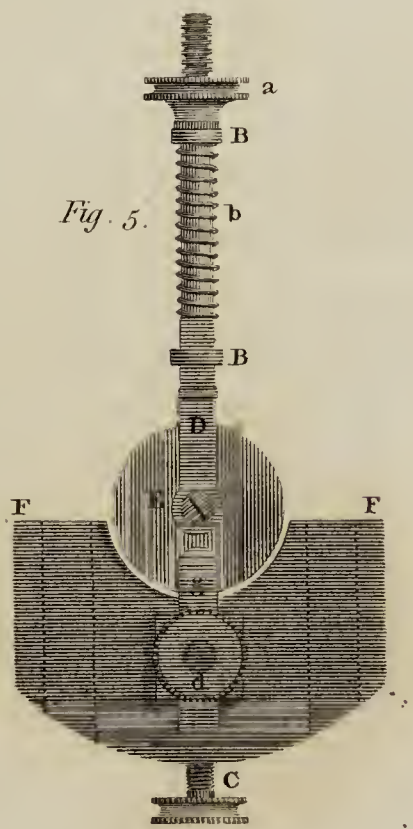
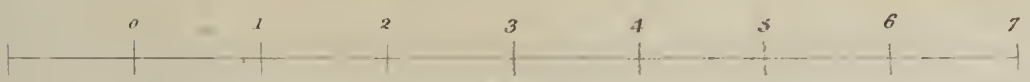


Fig. 5.





Inches.

Farey, Junr

Engraved by S. Porter.

as above-mentioned, regulated by the distance; the knife edge is placed above the roller D: in cutting the strap the smoothest side is placed downwards upon the lower roller. Figs. 4 and 5, are elevations of the other machine, for cut-the strap to an equal width throughout. A A is a brass bar made hollow, for lightness; B B an iron frame screwed to it, and supporting a frame D containing a roller E; the frame D slides up and down in the other by a screw and nut *a*, but it has a constant tendency towards the bar A by means of a spring *b*, which surrounds the screw, and counteracts the pressure of the nut *a*; F is a piece of the brass sliding upon the bar A, and can be fixed at any part of it by the screw C. it has a semicircular gap cut in it to admit the roller E as shewn in fig. 5: *g* is a small and thin sharp-edged knife, put through the end of the bar A, and held in its place by a screw *d*; this knife is placed exactly at the end of the roller, as seen in fig. 4. The strap to be cut is passed through the opening *e*, fig 4, and the roller suffered to descend by its nut .. until the spring presses the roller down upon the strap, with sufficient force to keep it steady; the piece F is fixed along the bar, at the same distance from the knife, as the strap is intended to be wide; and this is shewn by the divisions on the bar, the strap being then drawn through under the roller, the knife cuts away all parts which are beyond its edge, and reduces the strap to the proper breadth.

TWENTY GUINEAS *were this Session voted to Mr.* CHARLES WILLIAMS, *of No. 3, Cane Place, Gravel Lane, Southwark, for a Method of boring the conical part of Brass Cocks. The following Communication was received from him. An Explanatory Engraving is annexed, and a Drawing of the Machinery is preserved in the Society's Repository.*

SIR,

HAVING been for some time engaged in the business of making large brass cocks, for drawing off liquors, I found a very great inconvenience in boring the conical part, especially with the water-way cast in them. This circumstance suggested to me the necessity of a method of manufacturing them with more facility than had hitherto been practised.

Permit me to lay before the Society an apparatus for boring such cones with as much ease and accuracy, as cylindrical bores of any calibre, in a correct, simple, and handy manner. At any time it can be introduced to a common lathe, with little loss of time, and be worked by an ignorant person. Finding, by continual experience, this advantage to be important, I communicate it to the Society, in hopes, that by their generous encouragement, it may prove beneficial to trade in general.

I am, Sir,

Your obedient Servant,

CHARLES WILLIAMS.

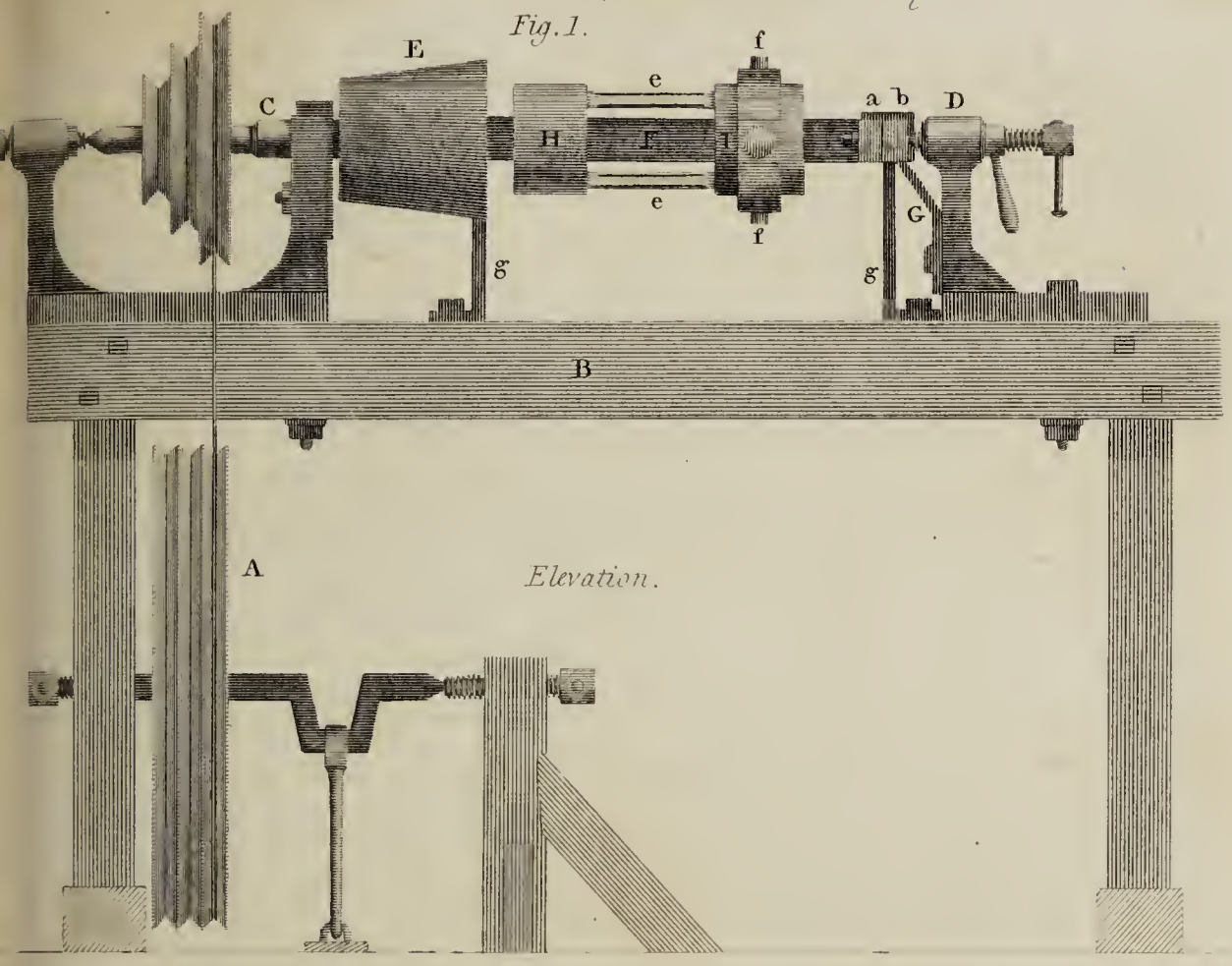
No. 3, Cane Place, Gravel Lane, Southwark, Jan. 5, 1810.

To C. TAYLOR, M. D. SEC.

Reference

Mr. Williams Machine for boring brass Cones.

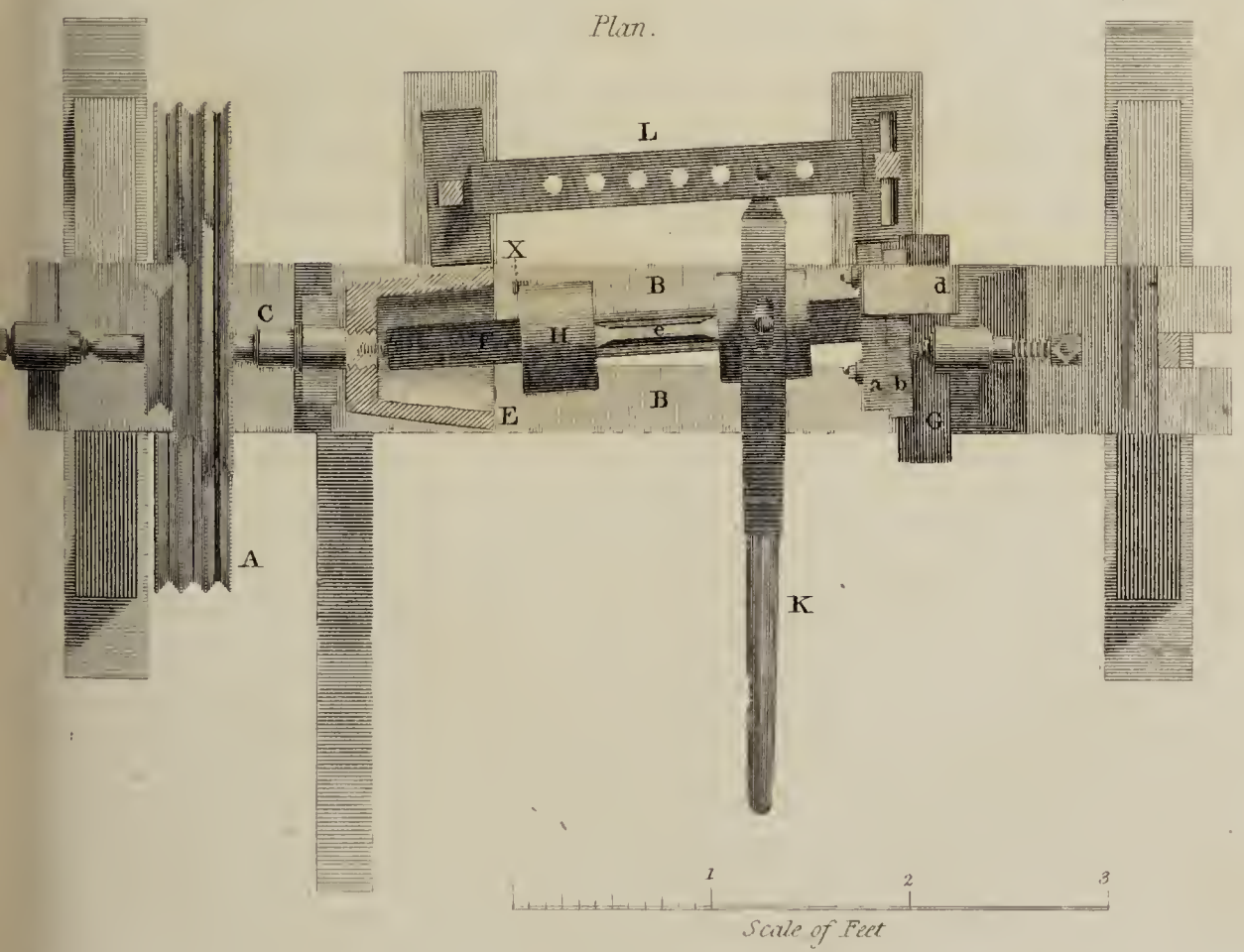
Fig. 1.



Elevation.

Fig. 2.

Plan.



Scale of Feet

...wn by J. Farey, Junr.

Engraved by S. Porter

Reference to the Engraving of Mr. Williams's Machine for boring Brass Cones, represented in Plate 10.

This apparatus is adapted to be fitted to any common turning lathe, with a few trifling additions: A, figs. 1 and 2 in the plate, is the foot-wheel of the lathe; B, the cheeks, C the mandrel, and D the front-puppet; the piece of work in which the conical aperture is to be bored, E, is fixed on a screw at the end of the mandrel, so as to revolve with it in the usual manner of turning; a small pin is screwed into the end of the mandrel, as shewn in the plan, fig. 2, which has a spherical head, and is received into a suitable cavity in the end of a square iron bar F, which is of sufficient length to extend to the front-puppet D; at this end it has a sort of crutch or cross head *a*, *b*, composed of two pieces lying parallel to each other, and united by two screw-bolts, which being fitted into oblong holes, admit a small lateral motion of the piece *b*, by the side of *a*; but they can be firmly held together by drawing the bolts tight; the piece *a* is formed from the same piece of steel as the bar F; and the other, *b*, has several holes bored in the far side of it, to receive the point of the screw of the front puppet D; these holes are at equal distances from each other, so that by introducing the screw in one or other of them, the bar F can be inclined to the axis of the mandrel, and by releasing the screws which unite *a* and *b*, a finer adjustment can be made of the intermediate spaces between the holes, so as to incline the bar F, in any angle within the limits of the length of the cross *a b*: the bar is supported by an iron frame G, screwed to the front puppet, and it is kept from rising by an iron clamp *d*, attached to G, and extending over *a*, *b*, it at the same time serves as an index to divisions upon *a*, which determines the angle of F and C.

Upon

Upon the bar F, two cylindrical sliders, H and I, are fitted to slide as freely and accurately as possible; the former is provided with a steel-cutter or tooth X, projecting a small quantity from its circumference, and it is this which performs the cutting or boring within the cone E, fixed to the end of the mandrel; the cutter slider H, is connected with the slider L, by two iron rods *e*, *e*, and I is moved along the bar by a lever K, which has a large opening or eye through it, to admit the slider I, and takes its bearing against two pins *f f*, fixed in the slider, and passing through holes in the lever; the lever is supported by an iron plate L, fig. 2, having several holes to receive a short pin projecting upwards from the end of the lever. The plate L is supported by two legs, *g g*, fig. 1, which are bolted to two wooden blocks projecting from the far side of the cheeks B; one of these bolts (see fig. 2) is passed through an oblong hole in the leg, so that the plate L can be moved backwards and forwards to be always parallel to the bar F. The manner of rising this machine scarcely needs any explanation, the work being put together as above described, and with a cutter X adapted to the size of the cone to be bored; the workman hooks the pin at the end of the lever K into any of the holes in the plate L, and by this means gains a power to thrust the cutter forwards into the cone, by pressing the end of the lever towards the mandrel, which is at the same time revolving with the work to be bored or turned out to a true cone by the cutter X; and it is evident that any number of cones which are afterwards to be turned by the same means, will be precisely of the same size and angle.

The SILVER MEDAL *of the Society was this Session voted to Mr.* EZEKIEL BAKER, *No. 24, Whitechapel-road, for a Method of rendering Fire-Arms, more safe to the Bearer, and more effectual in use. The following Communication was received from him. An Explanatory Engraving is annexed, and a Pistol on this construction is preserved in the Society's Repository.*

SIR,

I BEG leave to send, for the inspection of the Society of Arts, &c. some improvements which I have, at different times, made in the construction of fire arms, some of which will be found useful to gentlemen, sportsmen, and others, very serviceable in war, and already adopted by Government. I am therefore desirous to claim the merit of the inventions, and am willing they should be published for the public benefit.

For this purpose I have sent a description of the different improvements, and a pistol made conformably thereto; and I will with pleasure furnish any additional information that may be required by the Society.

I remain, Sir,

Your most obedient Servant,

EZEKIEL BAKER.

No. 24, *Whitechapel-road, Feb.* 22, 1810.

To C. TAYLOR, M. D. SEC.

The

The following CERTIFICATES *were received.*

From Lieutenant-Colonel B. BLOOMFIELD, of the Royal Horse-Artillery, stating, that he has inspected four of Mr. Baker's cavalry pistols, and considers them to possess superior advantages over those now in use, especially in their priming themselves, as this new method prevents waste of powder, and the uncertainty of the operation of loading on horseback, and is not so liable to damage in wet weather.

That he likewise considers the long hammer an improvement, as it prevents the pistol from cocking itself in the act of putting it into the holster. It also gives facility to the opening of the pan, in which operation, with the usual lock, the soldier often wounds himself with the flint.

From Lieutenant THOMAS SMITH, of the Seventh regiment Veteran Battalion, late Quarter-Master in the Royal Regiment of Horse-Guards, Blue; also from Lieutenant THOMAS SHEILS, of the Seventh Royal Veteran Battalion, Tower, formerly Serjeant in the Royal Veteran Battalion Dragoons; stating, that they have examined the pistol made by Mr. E. Baker, and are of opinion it is on the best principle that can be adopted for cavalry, by the improvement of the rammer, raised hammer, and a touch-hole to prime itself; and that from their long services on the Continent, they have frequently experienced the evil, noticed by Mr. Baker, in the common pistol.

From Lieutenant-Colonel OTWAY, of the Eighteenth Light Dragoons, stating, that Mr. Baker had showed him his pistol, and that he thinks to ensure its adoption in the cavalry it only requires that its merits should be made known.

known. That the swivel-rammer is now pretty generally in use; and it would, in his opinion, be extremely advantageous were pistols generally constructed to prime themselves.

That he is a warm advocate for the long hammer, knowing, by experience, how frequently the common pistol is forced to the full-cock in returning it to the holster-pipe; and that he once witnessed, from an accident of this nature, the most fatal consequences to a dragoon from its unexpected explosion.

From Lieutenant Colonel G. QUINTIN, of the Tenth Light Dragoons, stating, that he had minutely inspected a new pattern pistol with a swivel-rammer, which primes itself, the property of Mr. Baker, and finds that it answers the desired purpose in every respect.

A Description of several Improvements on Fire-Arms made by Mr. Ezekiel Baker.

First, The lock bolts itself in going into half-cock, by means of a small spring and lever behind the bolt, lying across the plate. The lever is pressed against the bolt by means of a spring, which is always pressing against it at the end of the bolt-spring, which lies on the sear-spring; there is a part which projects from it below the bottom of the spring with a piece at the end of the sear; as the lock is taken to half-cock by the round part of the tumbler, the sear is thrown up at that end, which lifts up the bolt-spring over the bolt; the cross-spring and lever then passing against the bolt, forces it into the notch of the tumbler,

which holds the cock fast, so that it cannot go to the cock until unbolted; this way of bolting will prevent many accidents which might have happened. In the present way of bolting, the bolt must be forced forwards with the thumb or finger into the tumbler; this is frequently forgot to be done, the person, in loading, thinking himself secure from danger of his piece going off, by means of the bolt when loaded, takes up his piece, thinking to unbolt and cock it, to his great surprise he finds it on full-cock, and he is himself exposed to great danger. This I have often done myself, for which reason I have made this improvement, which will be found useful, particularly so in rifle-guns and pistols, or any other fire-arms where a bolt is required.

Secondly, The hammer of the lock is raised towards the cock, which will prevent it from catching the top of the holster in putting in the pistol. Instances have been known that the pistol by that means has gone off, and both man and horse have been wounded. The hammer, raised in this manner, will also be found useful in soldiers' musket-locks, as it will prevent the thumb from being cut with the flint, which is frequently done in throwing the hammer back, as the springs are in general very strong, and the purchase is small, particularly with a new flint.

Thirdly, Locks in general throw the fire over the pan, which is of no use whatever; the fence here added under the hammer is a preventive; it moves with the hammer, and returns the fire into the pan, makes it more certain of firing, will prevent the oil from drying up, and the powder from clogging the joint of the hammer, and the pan being inclined towards the fence shortens the hammer face, and admits the fire quicker into the prime in the pan; the pan being grooved or raised as this is, would be found very

useful

useful in musket-locks: in the present way they are left flat, and after firing a few rounds the filth of the powder is collected against the fence, so that the hammer cannot joint down on the pan, which will admit wet or damp air into the prime, and which is a great hinderance to its firing; and sometimes the priming is also lost out of the pan; this I have often seen.

Fourthly, The screw of the lock being moved farther back from the breech of the barrel, will be a remedy against so many screws breaking, which hold in the locks, and the stocks from being split on the backside, both of which are great evils.

Fifthly, The rammer being swivelled will be found advantageous to cavalry, as the men cannot lose them, which is often done in the present way; besides they ram the charge home more certainly and quicker. The rammer might be left in the barrel when loaded with ball-cartridge, and it will keep the ball in its proper place. In the present mode of loading, from the motion of the horse, the ball is so shook, that it becomes loose in the barrel, and is even frequently left in the holster, so that when the pistol is taken out to be fired, it has not the effect that it would have had, had the ball been in its proper place. In taking the pistol out of the holster to present, the rammer will fall out of the way of the ball when fired, should there not be time to return the rammer into its proper place, and when fired both may be put into the holster together without any difficulty. The touch-hole being made wide to prime itself will be found of great utility to cavalry. In the present way of priming and loading on horseback, owing to the wind blowing, and the motion of the horse, great part of the powder is scattered before it is put into the barrel; and owing to the right quantity of powder not being put

in the barrel, and its bad ramming, the pistol is of little use when fired. It might be advanced, that great part of the force of the powder would be lost, by having the wide touch-hole; but the whole charge being now put into the barrel will make up that deficiency, and the same quantity will be at all times alike in the barrel. It may be loaded also in the night if required, which, in the present mode would be found very difficult to effect. The two holes in the lock-plate, one under the main-spring, the other over the hammer-spring, with an iron pin or nail put into them, will keep off the pressure of the springs, whilst the work is taken off to be cleaned and put on again, as the springs do not require to be taken off every time the work wants cleaning and oiling, which cannot be done until the springs are taken off in the present way of cleaning, and which is performed by means of cramps of various sorts, by which the springs are frequently set or broke: in the way above described, they will not be liable to either injury.

Reference to the Drawing of Mr. Baker's improved Pistol Plate, Pl. 11.

Fig. 1, is a profile of the whole taken together, in which the parts which are common to all pistols are too evident to need enumeration:—To proceed, therefore, to the improvement; A A is the ram-rod sliding through a ring *a*; see also fig. 2, which is pivoted into a forked-piece B, jointed to the barrel at C: the swivel has an universal motion, so that the ram-rod can be put by into its socket D, or put down into the barrel;

Mr. Baker's improved Pistol.

Fig. 1.

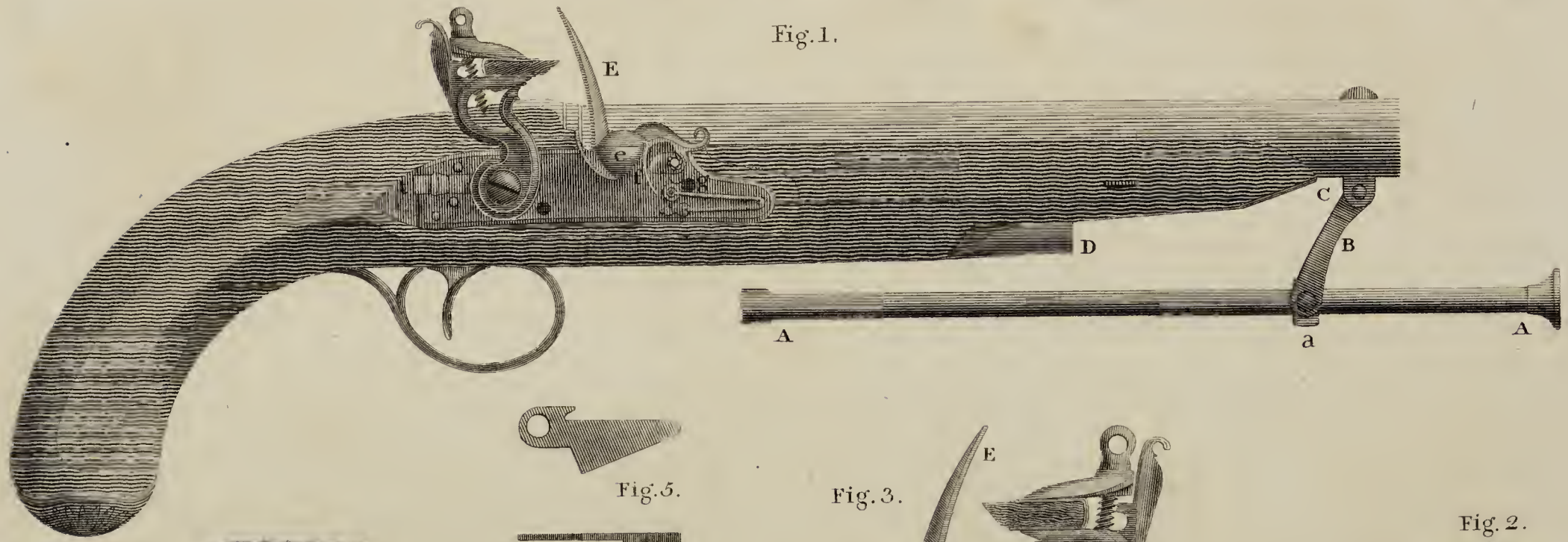


Fig. 5.

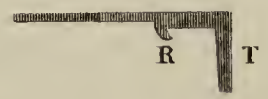


Fig. 3.

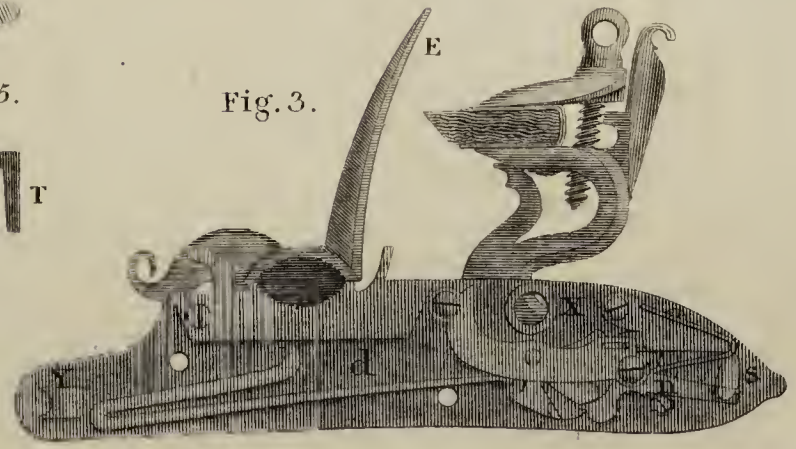


Fig. 4.

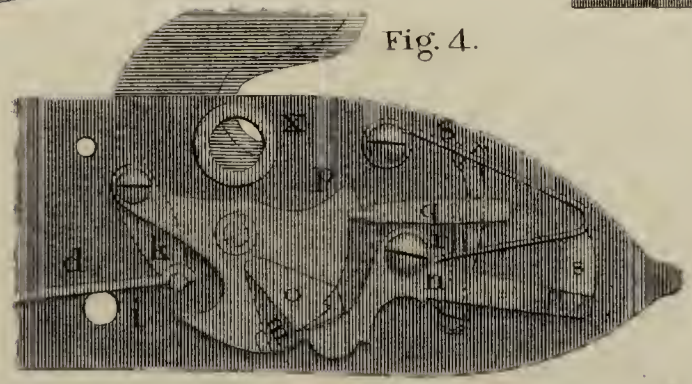
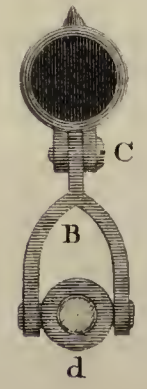


Fig. 2.



barrel; the fork B in that case being turned over the muzzle, and the ring *a* coming exactly into the centre thereof. E is the hammer raised towards the cock for the reasons pointed out in Mr. Baker's paper: *e* is the pan to which the hammer fits down very closely; and *f* is a projecting piece of the hammer formed to a circle from the centre of the hammer-joint; this fence encloses the joint and spring, and keeps the powder and fire from them: *g* is the hammer-spring, with a roller at the end, which acts upon the hammer. The interior of the lock is shewn in the other figures: *d*, fig. 4. is the main-spring; and *i*, fig. 4. is the hole to receive a nail, or iron pin, to stay the spring while the lock is taken to pieces: *k* is the connecting iron, which communicates the power of the spring to the tumbler: *m* is the notch in the tumbler, into which the sear *n* is received when at half-cock; the notch for full-cock is dotted under *o*, in the position of fig. 4. the lock is prevented from firing by the form of the notch *m*, in the usual manner of half-cock; and the cock is prevented from being drawn further back by the tooth *p* of the tumbler, which is caught by the bolt *q*, pressed forwards by the spring and lever *r*, situated beneath the sear and its spring S; before the cock can be set at full-cock the bolt must be withdrawn by its tail *t*, fig. 1.; and it is then retained by a spring-catch, fig. 5. screwed over the sear-spring, as in fig 3.; its tooth R catches a notch in the bolt when drawn back, and holds it; the cock is now at liberty to be set full, and fired in the usual way; when this happens the inclined wedge *s* of the sear is thrust under the part T, fig. 5, of the spring-catch, and raises it up; this relieves the bolt *q* from the tooth R, and is advanced towards the tumbler by its spring *r*, ready to prevent the lock being full-cocked without the bolt *t*, fig. 1. is first withdrawn: *o* is a loose piece fitted to move upon a centre in the tumbler; its

use is, when at full-cock, to cover the notch *m* for half-cock, and prevent the sear *m* catching therein when fired, for it is adapted to bear off the point of the sear; by the inclined form of its end it readily slips out of the way when the cock is drawn back to set either to half or full-cock: X, figs. 3 and 4, is the hole for the screw which goes through the stock to fasten the lock; the other end of the lock is held in by a hook Y, fastened to the plate which catches under the head of a screw, screwed into the stock withinside the lock; this screw needs not be touched to take off the lock, as it readily unhooks, when the screw at X is removed.

FIVE GUINEAS *were this Session voted to Mr.* J. D. ROSS, *Princes Street, Soho, for his Invention of a Machine for separating Iron Filings from their Mixture with other Metals. The following Communication was received from him. An explanatory Engraving is annexed, and a complete Model is preserved in the Society's Repository.*

SIR,

I HOPE you will be pleased to lay before the gentlemen of the Society of Arts, &c. the model of a machine which I have invented to separate iron-filings, turnings, &c. from those of brass or finer metals, in place of the slow and tedious process hitherto employed, which is by a common magnet held in the hand. By my invention many magnets may now be employed

employed at once, combined and attached to a machine on a large scale. The magnetic hammers are so contrived as to take up the iron-filings from the mixture of them with other filings, or metallic particles, placed in the trays or end-boxes, and drop them into the receiving-box in the centre, which is effected by the alternate motion of a winch-handle, working the two magnetic hammers placed at two angles of a quadrant or anchor. In proportion to the power of the magnets and to the force of the blow given by the hammers, a great quantity of iron is separated from the brass, by the alternate motion, and dropped into the receiver placed in the centre of the machine.

I have showed the model to persons engaged in various metallic works, who give me great encouragement by their signatures and sanction, and I hope it will meet with the Society's approbation.

I am, Sir,

Your most obedient and humble Servant,

J. D. ROSS.

55, *Princes-street, Leicester-square,*
April 12, 1810.

To C. Taylor, M. D. Sec.

The following persons certified that they consider Mr. Ross's invention of a machine for separating iron-filings, turnings, &c. from those of brass or finer metals, as likely to prove extremely useful in various branches of workers in metal.

Thomas Charles King, Founder and Plater, No. 10, Brownlow-street;

Calvert and Dowey, Hart-street, Covent-garden;

William Shawler, Litchfield-street;
J. Asquith, Metal Turner, St. Martin's-lane;
Charles Bond, Old Compton-street, Soho;
John Turmeau, Goldsmith, Carleton-place;
J. Perigal, Watch Maker, 55, Princes-street, Soho;
George Hall, Gold Worker, 482, Strand;
P. Storr, Silversmith, Dean-street, Soho;
H. Hall, Coach Plater, 5, Cross-lane, Long Acre;
W. Williams and Son, Button Makers and Silversmiths, 103, St. Martin's-lane.

Reference to the Drawing of Mr. Ross's Machine for separating Iron Filings from those of Brass, or other Metals, Fig. 1 *and* 2, *Pl.* 12.

A is an axis of brass, and B a handle upon the end of it: C is a piece of brass in form of an anchor, at each end of which a horse-shoe magnet is fixed, in the manner shewn at fig. 1, where *c* is the arch of the anchor, and *d* a piece of brass having a hole through it to receive the legs *e e* of the magnet, which is fixed to the arch by a screw *f*, tapped into the arch. The anchor is mounted upon the pivots of the axis A, in a frame E, which incloses it; on the outside of the frame two blocks of wood FF are situated, in each of which a hollow or tray is formed to receive the filings which are to be separated from the iron they contain in these hollows. The magnets fixed at the ends of the anchor strike upon the filings, and select, by the magnetic attraction, all the iron among them; the anchor is then turned over by the handle B, and the opposite magnet strikes in the other hollow F, at this time the other magnet is just over the axis, and by the

the jerk of its opposite striking the block F, the iron-filings are shook off and fall down in the bottom of the frame, or receiver; in this manner the handle B, being moved backwards and forwards, strikes the magnets alternately in the two blocks F, at the same time that one strikes, the opposite is cleared from the iron it has picked up by the shock; G is a screen of thin board to prevent the filings being scattered.

FIFTEEN GUINEAS *were this Session voted to Mr.* G. MARSHALL, *No.* 15, *Cecil Court, St. Martin's Lane, for constructing Sash Windows, so as to be cleaned or repaired without the necessity of any Person going on the outside of the House. The following Communication was received from him. An explanatory Engraving is annexed, and a Sash Frame made upon this plan is preserved in the Society's Repository.*

SIR,

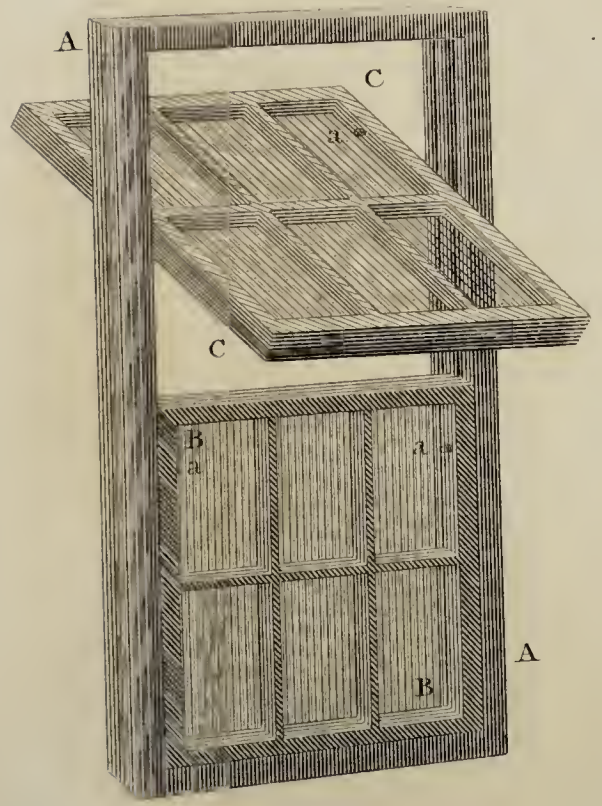
IN consequence of the numerous accidents which occur from cleaning and painting the outside of windows, I beg leave to submit to the inspection of the Society a model of a sash-window, which if it meets their approbation and becomes generally adopted will, I think, save the life of many a fellow-creature, because the present mode of cleaning or painting the outside of windows is generally done by persons leaning out of the window, or getting upon a plank,

or

or some other convenience made for the purpose, and projecting on the outside of the house; hence, from carelessness and inattention, many fatal accidents have occurred, and the services of many persons lost to their families and the public. One instance of this kind happened about three weeks ago to a man who was standing on a board cleaning the outside of a window, when the board giving way, as frequently happens, the man was precipitated, and impaled upon the spikes of the iron pales which inclosed the area below, from whence he was conveyed to the hospital with no hopes of recovery. This unhappy man, I was informed, had a large family depending upon him for subsistence. I was so shocked with the circumstance, that I was not easy till I had made a model which I thought would be the means of preventing similar accidents. This model I beg leave to lay before the Society, and if it should be so fortunate as to meet with their encouragement, I will receive any donation from them with thankfulness, and have no doubt that it will be found to possess many advantages. In appearance it resembles a common sash, and the upper or lower sheet may be moved up and down in a similar manner; besides which, by pushing two small springs back in the upper sheet, and at the same time pulling the sash inwards, you may turn the outside of the sash towards you, into the room, so that it may be easily painted, glazed, or cleaned by a person standing within the room, without the necessity of removing the slips or beadings, by doing which, in the common mode, the glass is frequently broken and the beads lost, left loose, or mismatched, and a considerable expense incurred. By turning the lower sash of my invention in an horizontal or inclining direction, you can look into the street without being wet in rainy weather, or the rain driving into the

Mr. G. Marshall's New Window Sash.

Fig. 3.



Mr. Ross's Machine for separating Iron-filings from those of Brass.

Fig. 1.

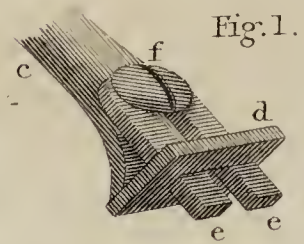
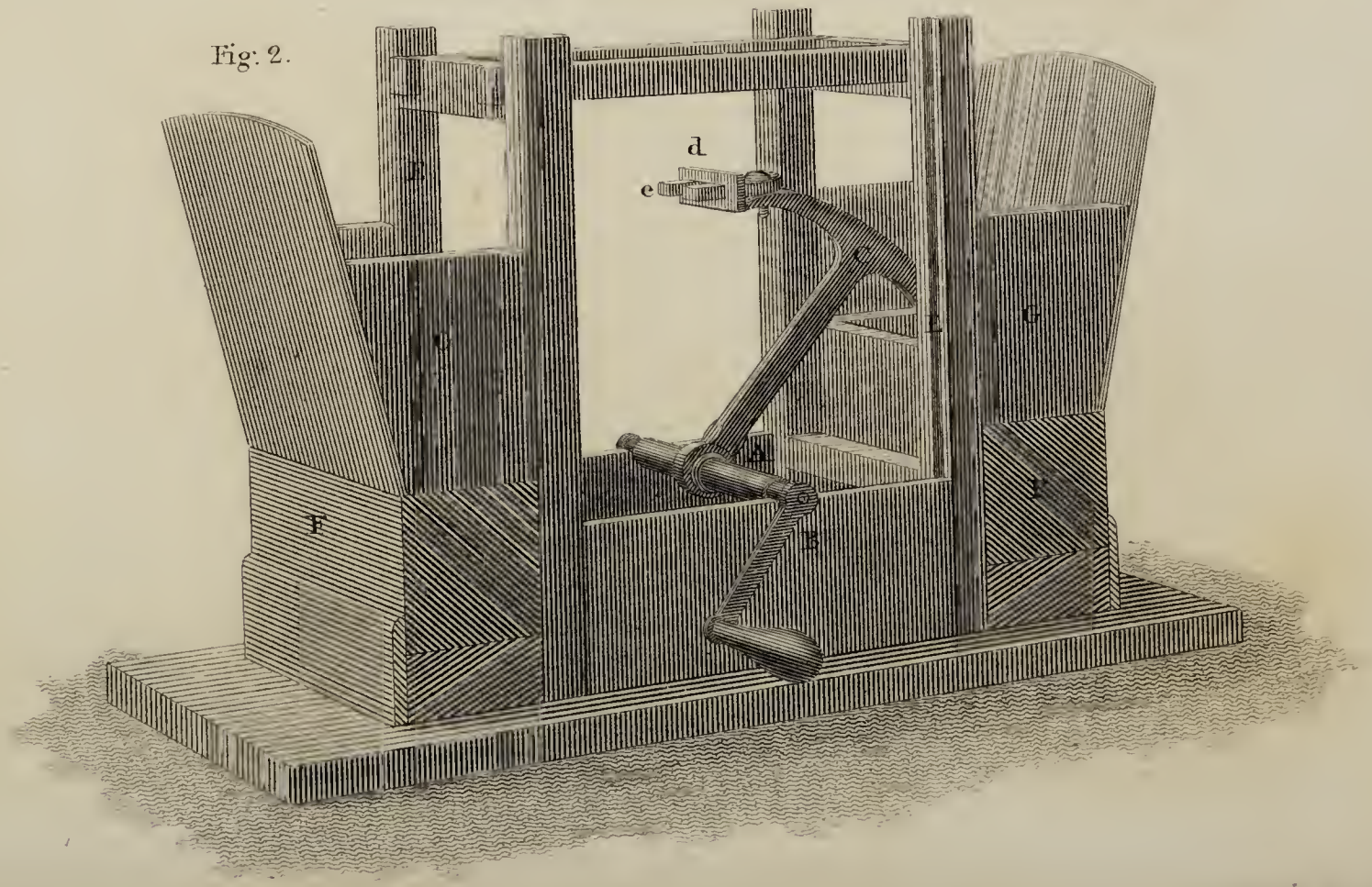


Fig. 2.



Drawn by J. Farey Junr.

Engraved by S. Porter.

the room and damaging the furniture. Old windows may be altered to act upon this principle, at an expense of twelve shillings per window; and new sashes and frames may be thus made for only six shillings more than the common price.

I remain, Sir,

Your obedient humble Servant,

GEORGE MARSHALL.

15, *Cecil-court, St. Martin's-lane,*
Feb. 9, 1810.

To C. Taylor, M. D. Sec.

Reference to the Drawing of Mr. Marshall's Window-Sash, Fig. 3, Pl. 12.

A A represents the window-frame; B B the lower, and C C the upper sash: the frame A A is fitted with grooves, weights, and pulleys, in the usual manner; the fillets on the sash which enter the grooves are not made in the same piece with the sash-frame, but fastened thereto by pivots about the middle of the sash; upon these pivots the sash can be turned as at C C, so as to get at the outside without disturbing the fillets or grooves; when the sash is placed vertical, as B B, two spring-catches at *a a* shoot into and take hold of the sliding fillets, so that in this state the sash slides up or down in the usual manner, but can be immediately released, and turned inside out by pushing back the springs, and at the same time pulling the sash inwards; this turns the outside towards the room, so that the sash may easily be

be painted, glazed, or cleaned on the outside by a person within the room, without removing the beads which confine the sash to slide up and down vertically; in the common way these beads are frequently broken or misplaced, and cause considerable trouble by being always loose. By inclining the sash on its pivots, the highest point being within the room, the window may be left open in the most severe rain without danger of any entering the room, and a person may look out into the street without being wet.

The SILVER MEDAL *of the Society was this Session voted to Mr.* WILLIAM MOULT, *No. 37, Bedford-square, for his Method of applying the Filtering-Stone for purifying Water. The following Communication was received from him. An Explanatory Engraving is annexed, and a Model of the Apparatus is preserved in the Society's Repository.*

SIR,

IF you think the following information, relative to a new method of filtering water, is deserving of the attention of the Society of Arts, &c. I wish you would lay it before them. My objections to the old method of filtering by putting water into the filtering-stone are, that the dirt falls to the bottom, and fills up, or chokes the pores of the filtering-stone, so that the stone requires frequently to be cleaned with a brush and sponge to allow the water to pass, after which

which the water passes through the stone in a muddy state for two or three days; it likewise requires to be frequently filled, and as it empties less water comes in contact with the stone, and therefore a smaller quantity, in such a state, can only pass through. Likewise a filtering-stone used in the common way soon becomes useless, from the filth insinuating itself into the internal parts of the stone, out of the reach of the brush.

In the method I propose and practise, the filtering-stone placed within the water to be purified, which presses upon the outside of the filter, and the stone does not require to be supported in a frame as it needs only to stand within the water cistern; it will thus filter, in an equal time, double the quantity of water procured in the common mode; it fills itself and requires no cleaning. I have upon this plan used one for more than three years with great success.

I am, Sir,

Your humble Servant,

WILLIAM MOULT.

No. 37, Bedford-square, April 18, 1810

To C. Taylor, M. D. Sec.

Certificates.

We, the undersigned, having inspected and examined a new mode of employing the ordinary filtering-stone, discovered by William Moult, are of opinion that its superiority over the customary method is so great as to entitle it to particular notice.

That it not only supplies an infinitely greater quantity of purified

purified and limpid water, but is capable of preserving its porosity free and pervious for years together, by an occasional self-operation.

That by this valuable process the principal objections to drip-stones is removed, viz. the constant labour they require to keep them clean by means of brushes, without eventually producing the intended effect, and without preventing their being finally rendered useless.

D'Arcy Preston, Captain in the Royal Navy;
Charles Gower, M. D.;
Thomas Pitt, Esq. V. P. Wimpole-street;
Richard Davenport, Esq. Wimpole-street.

Reference to the Drawing of Mr. Moult's Filtering Apparatus, Fig. 1, *Pl.* 13.

A A is the cistern containing the water to be filtered; the filtering-stone B is suspended in the cistern by a ring around the inside of it, which catches the projecting part of the stone; the water in the cistern filters through into the stone. D is a syphon which conveys the filtered water from the inside of the stone into a cistern E, which is the reservoir for clean water. *d* a cock to draw it off as it is wanted. By this mode of filtration the impurities of the water are deposited in the bottom of the cistern A, instead of being left in the bottom of the stone as in the usual mode.

FIFTEEN GUINEAS *were this Session voted to Mr.* BENJAMIN SMITH, *No.* 11, *Turnham-place, Curtain-road, Shoreditch, for his Method of raising a loaded Cart when the Horse in the Shafts has fallen. The following Communication was received from him, and a complete Model, to explain the Principle, is preserved in the Society's Repository.*

SIR,

I HAVE taken the liberty of sending you a model with a brief explanation of the utility of my invention, in order that it may be laid before the Society instituted for the Encouragement of Arts, &c. to whose comprehensive judgment and abilities I with great deference submit it for their determination, whether they think it likely to be attended with the success and utility which I flatter myself it deserves. From the simplicity of the construction and the trivial expense attending it I presume there will be no bar to its universal adoption. I respectfully submit it to the discernment and decision of the Society, who will, I am convinced, give it all the merit and approbation it may deserve.

The reason which prompted me to undertake this business is, from having seen a horse which had fallen down under the immense weight of a heavy-loaded cart, where it lay for a considerable time in that painful and dangerous situation, which naturally excited compassion even in the most obdurate heart. Every person frequenting the streets of this metropolis must have witnessed similar scenes; and indeed it surprises me that long before now some expedients have not been publicly

publicly suggested to remove the mischief arising from such occurrences, considering the great encouragement that is given in this enlightened age to all useful improvements.

Having conversed on this subject with persons who possess considerable knowledge of horses, and who constantly employ these noble animals, I find that horses remaining so long as they usually do in such improper positions, and from being often dragged a considerable distance by fruitless endeavours to raise them, are much endangered in their health and lives, and that their situation upon the stones is more prejudicial than the injury received by the fall.

I flatter myself that my method will be found to raise the whole weight of the cart, and a considerable part of that of the horse, in the short space of three or four minutes from the moment of the accident, by means simple and useful, and within the reach of the meanest capacity to execute; and that the whole apparatus will not cost above fifty shillings, and will last many years. Requesting your kind attention,

I am, Sir,

Your most obedient Servant,

BENJAMIN SMITH.

No. 11, *Turnham-place, Curtain-road, Shoreditch, London, Dec.* 13, 1809.

To C. Taylor, M. D. Sec.

Advantages derivable from this Invention:

1.—The invention is of itself so simple, and the operation so conspicuous at the first view, that the whole process may be easily comprehended and executed.

2.—The

2.—The apparatus may be fitted with little difficulty to any cart now in use for heavy loads, such as bricks, coals, corn, or the like.

3.—The chains which lead from the uprights at the back part of the cart to the fore part of it on each side are for the purpose of taking the purchase therefrom, and making the back part of the cart act as a lever at the time the horses are drawing behind, which without fail, with the strength of one, two or three horses fastened there to raise the one which is down in the shafts, will instantly assist him to get upon his feet.

4.—The number of horses to draw a cart are usually in proportion to the weight contained therein; therefore supposing three horses are employed to draw it, and the shaft horse falls, the carman has only to unhook the two leaders and then hook them to the short chain at each side of the back of the cart, and with their strength the fallen horse will be so relieved from the weight as to raise himself without further assistance.

5.—The same principle may be applied in different ways from what I have shown in the model; for instance, another mode may be adopted by framing the tail-board of the cart strong enough to bear the purchase, and with the use of the two side chains above-mentioned, it may be made to answer the purpose.

Another plan, though more expensive, is by obtaining two wrought-iron uprights to be fixed as substitutes for the truss-staffs at the back part of the cart, with a hole in the top of each to receive an iron rod, which is occasionally to be introduced, reaching from one side of the cart to the other, connecting the two uprights together; when in action the two side chains to be used as in other cases.

Reference to the Drawing of Mr. Smith's Method of raising up a Horse when fallen down in the Shafts of a loaded Cart, Fig. 2, Pl. 13.

A is the wheel, and B the shafts of a cart, such as is used in London; C the side rails; at the end of the body an iron stancheon or truss-staff, *a*, is fixed by a hinge at the lower end, and at the upper end it is supported by a chain *b*, extended from the fore part of the body of the cart; this diagonal chain forms a firm support to the stancheon. This is all the addition made to the common cart, and is used in the event of the shaft-horse falling, by hooking the traces of the other horses to a chain *d*, also fixed to the stancheon; the power of these horses, applied at this height above the fulcrum, will have a great purchase to elevate the shafts and set the fallen horse at liberty, as is evident from an inspection of the figure. The stancheon moves on a joint on its lower end, and the oblique chain unhooks at *b*; the end can be connected with a short piece of chain *e* fastened to the last of the side-rails; the stancheon now takes the position of the dotted lines *f*, and the short chain which hangs down perpendicular from the end of it, may be taken hold of by any number of men, to weigh upon and raise the cart in cases where the horses cannot conveniently be applied; the men will in this manner have much greater effect than merely (as is the common practice) weighing on the hind part of the cart.

When the chain is completely detached, and the stancheon suffered to hang down perpendicularly, it forms a prop to support the cart steady whilst it is unloaded. It should be observed, that though only one stancheon appears in the figure, there are in fact two, one being placed on each side of the cart.

CERTIFICATE.

Mr. Moult's Filtering Apparatus.

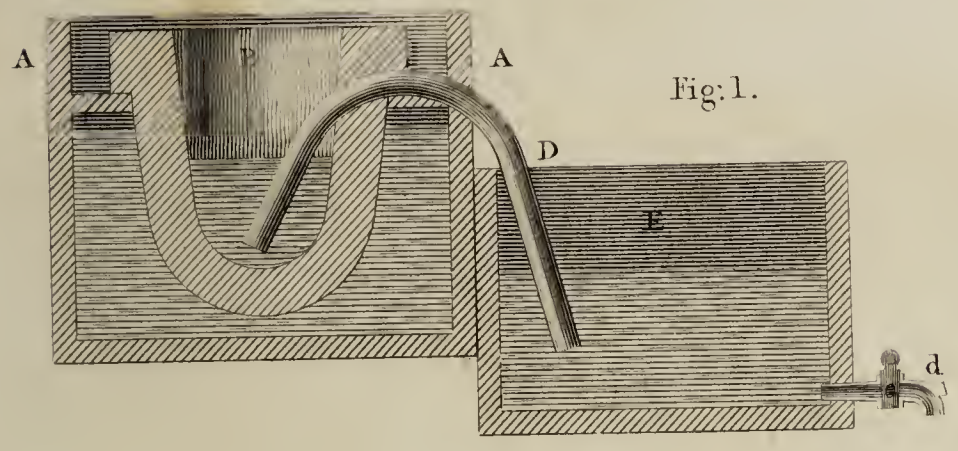


Fig: 1.

Mr. Smith's method of relieving a Horse which has fallen in the shaft of a loaded Cart.

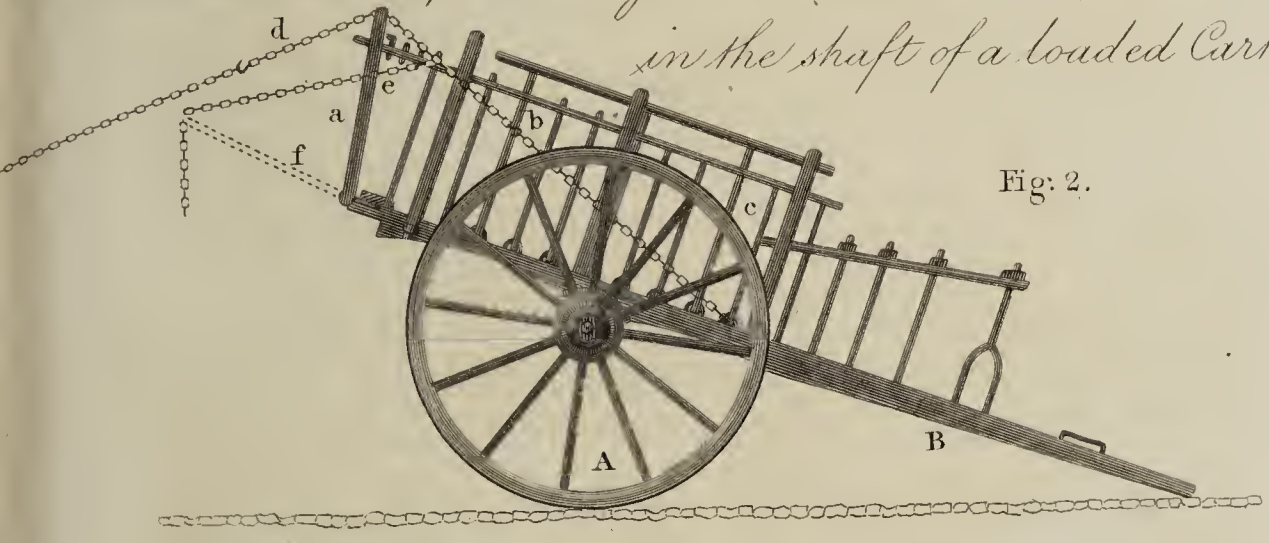


Fig: 2.

Mr. Taylor's Air Exhauster for Mines.

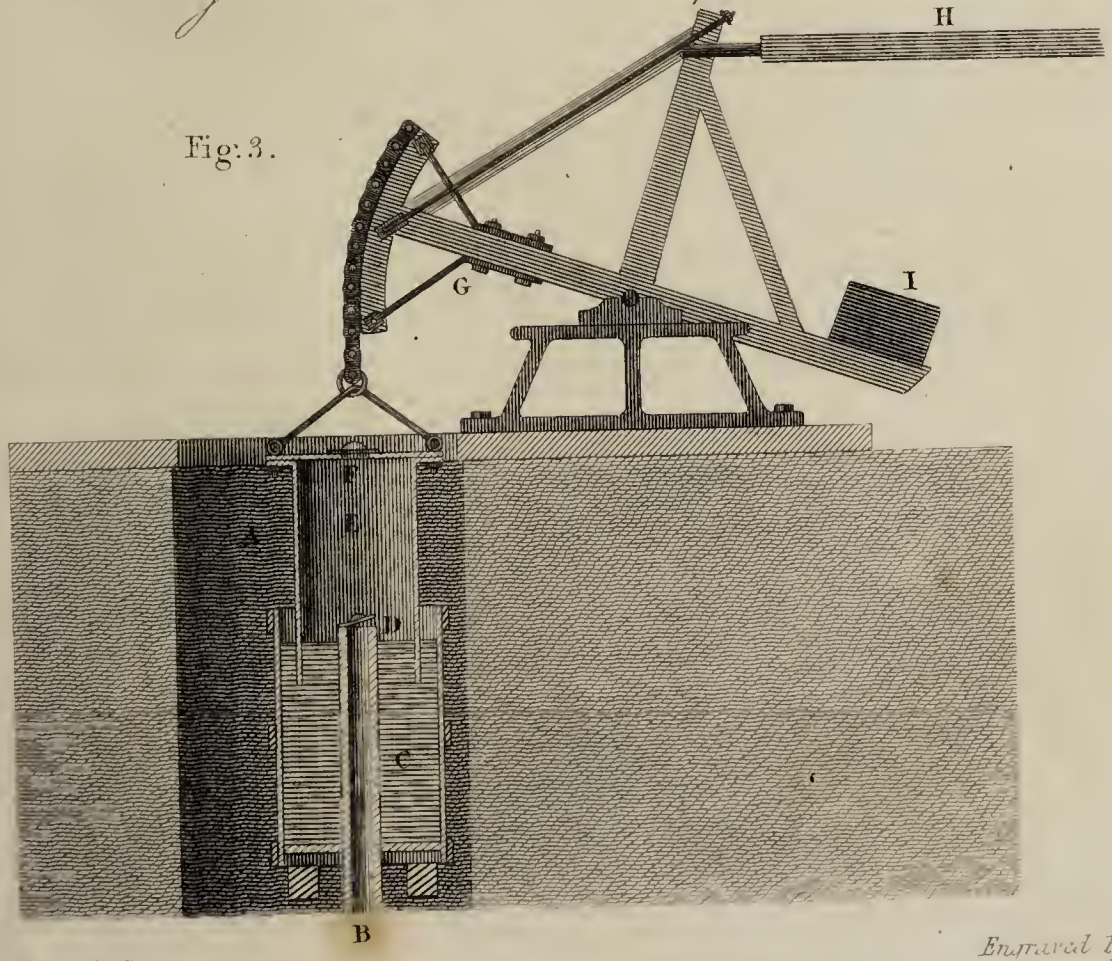


Fig: 3.

Drawn by J. Farey Jun.r

Engraved by S. Porter.

CERTIFICATE.—Mr. WILLIAM WHITEHEAD, Jun. of Cadogan-place, Sloane-street, certified, that he had attended experiments made to ascertain the efficacy of Mr. Smith's invention; that a cart weighing twenty-three hundred-weight, loaded with one ton of stones, was raised by means of Mr. Smith's apparatus with ease by one horse.

That he very much approves of Mr. Smith's invention, and thinks it likely to be of great service in general practice, more especially on account of the business being effected with little expense. That many carts are already so formed that very little additional apparatus will be required to complete them for the purpose.

The SILVER MEDAL *of the Society was this Session voted to Mr.* JOHN TAYLOR, *of Holwell, near Tavistock, for his Method of Ventilating Mines, or Hospitals, by extracting the foul Air from them. The following Communication was received from him. An Explanatory Engraving is annexed, and a Drawing of the Apparatus is preserved in the Society's Repository.*

SIR,

I SEND you herewith a drawing and description of a machine of my invention for the ventilation of mines, with a

view to their being laid before the Society for the Encouragement of Arts, &c. and hope they will meet with their approbation.

I am, Sir,

Your obedient Servant,

JOHN TAYLOR.

Holwell, April 9, 1810.

To C. Taylor, M. D. Sec.

On the Ventilation of Mines, with the Description of a new Machine for that Purpose. See Pl. 13. *Fig.* 3.

Next in importance to the means employed for draining underground works from water may be reckoned those which are intended to afford a supply of pure air, sufficient to enable the workmen to continue their operations with ease and safety to themselves, and to keep up, undiminished, the artificial light upon which they depend. It is well known, indeed, to all who are practically engaged in concerns of this kind, that men are frequently obliged to persevere in their labour, where a candle will scarcely burn, and where not only their own health materially suffers in the end, but their employers are put to considerable additional expense by the unavoidable hinderance and the waste of candles and other materials.

I mean to confine the following remarks to such mines as are worked upon metalliferous veins, according to the practice of this district, and that of the great seat of mining in the neighbouring county of Cornwall, from which indeed our's

our's is borrowed. We find then that a single shaft, not communicating by levels to another, can hardly be sunk to any considerable depth, nor can a level (or as the foreign miners call it, a gallery) be driven horizontally to any great distance without some contrivance being had recourse to for procuring currents of air to make up the deficiency of oxygen, which is so rapidly consumed by respiration and combustion in situations like these, where otherwise the whole remains in nearly a stagnant condition.

We are here unacquainted with the rapid production of those gasses which occasionally in the collieries are the cause of such dreadful effects; such as hydrogen gas, or the fire-damp, carbonic acid, or the choke-damp; the inconvenience we experience takes place gradually as we recede from the openings to the atmosphere, and seems to arise solely from the causes I have before assigned, though it is found to come on more rapidly in certain situations than in others.

The most obvious remedy, and that which is most frequently resorted to, is the opening a communication either to some other part of the mine or to the surface itself, and as soon as this is done the ventilation is found to be complete, by the currents which immediately take place, often with considerable force, from the different degrees of temperature in the subterranean and upper atmospheres; and these currents may be observed to change their directions as the temperatures alternate.

The great objection to this mode of curing the evil is, the enormous expense with which it is most commonly attended. In driving a long level, or tunnel, for instance, it may happen to be at a great depth under the surface, and the intervening rock of great hardness; in such a case every shaft which much be sunk upon it for air alone, where not required (as often they might not) to draw up the waste, would cost

several hundred pounds; or in sinking a shaft it may be necessary, at an expense not much less, to drive a level to it from some other for this purpose alone.

To avoid this, recourse has been had to dividing the shaft or level into two distinct parts, communicating near the part intended to be ventilated, so that a current may be produced in opposite directions on each side the partition, and this, where room is to be spared for it, is often effectual to a certain extent. It is found however to have its limits at no very great distance, and the current at best is but a feeble one, from the nearly equal states of heat in the air on each side. The only scheme besides these, that I know of, has hitherto been to force down a volume of purer air, through a system of pipes placed for the purpose, and a variety of contrivances have been devised for effecting this; most of them are so old that they may be found described in Agricola's work *De re Metallicâ*. The most common are by bellows worked by hand; by boxes or cylinders of various forms placed on the surface with a large opening against the wind, and a smaller one communicating with the air-pipes by a cylinder and pistern working in it, which when driven by a sufficient force has great power; but the cheapest and most effectual scheme for this purpose, where circumstances will admit of its being applied, is one which I adopted some time since in the tunnel of the Tavistock canal. It is by applying the fall of a stream of water for this purpose, and it has been long known that a blast of considerable strength may be obtained in this manner, which has the advantage of being constant and self-acting. The stream being turned down a perpendicular column of pipes, and dashing in at a vessel so contrived as to let off the water one way, with an opening at another part for the air, which being pressed into it by the falling water, may be conveyed

in

in any direction, and will pass through air-pipes with a strong current, which will be found efficacious in ventilating mines in many instances, as it has likewise, in some cases, been sufficient for urging the intensity of fires for the purposes of the forge. It is easily procured where a sufficient fall is to be had, and the perpendicular column can be so fixed as that the water from the bottom may pass off, while the air is forced into a pipe branching from the air-vessel, and which is to be continued to the part of the mine where the supply of fresh air is required.

I have found, however, that the forcing into vitiated air a mixture of that which is purer, even when the best means are used, though a measure which affords relief, is not in bad cases a complete remedy, and where the operation depends on manual labour, or any means that are not unremitted in their action, it becomes quite ineffectual. The foul air, charged with the smoke of gunpowder used in blasting, and which it strongly retains, is certainly ameliorated by the mixture of pure air, but is not removed. While the blast continues, some of it is driven into the other parts of the mine; but when the influx of pure air ceases it returns again, or if during the influx of pure air a fresh volume of smoke be produced by explosions which are constantly taking place, it is not until some time afterwards that it becomes sufficiently attenuated for the workmen to resume their stations with comfort.

A consideration of these circumstances led me to think that the usual operation of all ventilating engines ought to be reversed to afford all the advantages that could be desired; that instead of using the machines, which serve as condensers, exhausters should be adopted; and thus, instead of forcing pure air into that in a vitiated state, a complete

remedy could only be had by pumping out all that was impure as fast as it became so.

Many modes of doing this suggested themselves to me, by the alteration of the machines commonly applied, and by producing an ascending stream of air through pipes by a furnace constructed for the purpose. The latter mode would however have been here expensive in fuel as well as in attendance, and the others required power to overcome the friction of pistons, and so on, or considerable accuracy in construction.

I at last erected the machine, of which the annexed is a drawing, which, while it is so simple in construction, and requires so small an expense of power, is so complete in its operation, and its parts are so little liable to be injured by wear, that as far as I can imagine, nothing more can be desired where such a one is applied. This engine bears considerable resemblance to Mr. Pepy's gazometer, though this did not occur to me until after it was put to work, it will readily be understood by an inspection of the drawing, where the shaft of the mine is represented at A; and it may here be observed, that the machine may be as well placed at the bottom of the shaft as at the top, and that in either case it is proper to fix it upon a floor, which may prevent the return of the foul air into the mine, after being discharged from the exhauster; this floor may be furnished with a trap-door to be opened occasionally for the passage of buckets through it.

B the air-pipe from the mine passing through the bottom of the fixed vessel or cylinder C, which is formed of timber and bound with iron hoops; this is filled with water nearly to the top of the pipe B, on which is fixed a valve opening upwards at D.

E the

E, the air, or exhausting-cylinder, made of cast-iron, open at the bottom and suspended over their air-pipe, immersed some way in the water. It is furnished with a wooden top, in which is an opening fitted with a valve likewise opening upwards at F.

The exhausting-cylinder has its motion up and down given to it by the bob G, connected to any engine by the horizontal rod H, and the weight of the cylinder is balanced, if necessary, by the counterpoise I.

The action is obvious.—When the exhausting cylinder is raised, a vacuum would be produced, or rather the water would likewise be rained in it, were it not for the stream of air from the mine rushing through the pipe and valve D. As soon as the cylinder begins to descend, this valve closes and prevents the return of the air which is discharged through the valve F.

The quantity of air exhausted is calculated of course from the area of the bore of the cylinder, and the length of the stroke.

The dimensions which I have found sufficient for large works are as follow :

The bore of the exhausting cylinder two feet.

The length six feet, so as to afford a stroke of four feet.

The pipes which conduct the air to such an engine ought not to be less than six-inch bore.

The best rate of working is from two to three strokes a minute; but if required to go much faster it will be proper to adapt a capacious air-vessel to the pipes near the machine, which will equalize the current pressing through them.

Such an engine discharges more than two hundred gallons of air in a minute; and I have found that a stream of water supplied by an inch and a half bore falling twelve feet, is sufficient to keep it regularly working.

A small

A small engine to pump out two gallons at a stroke, which would be sufficient in many cases, could be worked by a power equal to raising a very few pounds weight, as the whole machine may be put into complete equilibrium before it begins to work, and there is hardly any other friction to overcome but that of the air passing through the pipes.

The end of the tunnel of the Tavistock Canal, which it was my object to ventilate, was driven into the hill to a distance of near three hundred yards from any opening to the surface, and being at a depth of one hundred and twenty yards, and all in hard schistus rock, air-shafts would have been attended with an enormous expense; so that the tunnel being a long one, it was most desirable to sink as few as possible, and of course at considerable distances from each other. Thus a ventilating machine was required, which should act with sufficient force through a length of near half a mile, and on the side of the hill where it first became necessary to apply it, no larger stream of water to give it motion could be relied on, than such a one as I have mentioned after the description of the engine, and even that flowed at a distance from the shaft where the engine was to be fixed, which made a considerable length of connexion-rods necessary.

Within a very short time after the engine began to work, the superiority of its action over those formerly employed was abundantly evident. The whole extent of the tunnel which had been uninterruptedly clouded with smoke for some months before, and which the air that was forced in never could drive out, now became speedily so clear, that the day light and even objects at its mouth were distinctly seen from its farthest end. After blowing up the rock, the miners could instantly return to the place where they were employed, unimpeded by the smoke, of which no appearance would remain underground in a very few minutes, while it might

might be seen to be discharged in gusts, from the valve at the top of the shaft. The constant current into the pipe, at the same time effectually prevented the accumulation of air unfit for respiration. The influx of air, from the level into the mouth of the pipe, rushes with such force as instantly to extinguish the flame of a large candle; and any substance applied, so as to stop the orifice, is held tight by the outward pressure.

It is now more than two years since the machine was erected, and it has been uninterruptedly at work ever since, and without repair. The length of the tunnel has been nearly doubled, and the pipes of course in the same proportion, and no want of ventilation is yet perceptible.

Two similar engines have been since constructed for other parts of the same tunnel, and have in every respect answered the purpose for which they were designed.

The original one is worked by the small stream of water before-mentioned, by means of a light overshot-wheel twelve feet in diameter, and about six inches in breast.—The two others are attached to the great overshot-wheel which pumps the water from the shafts which are sinking upon the line, and as their friction is comparatively nothing, this may be done in any case, with so little waste of power for this purpose as not to be an object of consideration, even if the power be derived from more expensive means.

The size of the exhauster may always be proportioned to the demand for air, and by a due consideration of this circumstance, this engine may be effectually adapted not only to mines and collieries, but also to manufactories, workhouses, hospitals, prisons, ships, and so on.

Thus, if it were required to ventilate a shaft of a mine, or a single level, which is most frequently the case, where three men are at work at one time, and we allow that those

three

three men vitiate each twenty-seven and a half cubic inches of air per minute, (as determined by the experiments of Messrs. Allen and Pepys), and allowing further that their candles vitiate as much as the men, there will be six times twenty-seven and a half cubic inches of air to be drawn out in a minute, equal to one hundred and sixty-five.

Now a cylinder five inches in diameter, working with a stroke of nine inches, will effect this by one stroke in a minute, though it would certainly be advisable to make it larger.

Not being practically acquainted with collieries, or mines that suffer from peculiar gasses that are produced in them, I cannot state, from actual experiment, what effect this machine might have in relieving them; but it must appear, I conceive, evident to every person at all acquainted with the first principles of pneumatics, that it must do all that can be wished, as it is obvious that such a machine must in a given time pump out the whole volume of air contained in a given space, and thus change an impure atmosphere for a better one. And in constructing the machine it is only necessary to estimate the volume of gas produced in a certain time, or the capacity of the whole space to be ventilated. It is easy to judge how much more this must do for such cases as these, than such schemes as have lately been proposed of exciting jets of water, or slaking lime, both of which projects, likewise, must fail when applied; as one of them has, I believe, been proposed to be to the case of hydrogen gas. But with such a machine as this, if the dreadful effects of explosions of this air are to be counteracted, it may be done by one of sufficient size to draw off this air as fast as it is generated; and by carrying the pipes into the elevated parts of the mine where from its lightness it would collect. If, on the other hand, it is desired to free any subterraneous work from the carbonic acid-gas, it may as

certainly

certainly be done by suffering the pipe to terminate in the lower parts, where this air would be directed by its gravity.

In workhouses, hospitals, manufactories, &c. it is always easy to calculate the quantity of air contained in any room, or number of rooms, and easy to estimate how often it is desirable to change this in a certain number of hours, and to adjust the size and velocity of the engine accordingly. Where this change of foul air for pure is to take place in the night, means for working the machine may be provided by pumping up a quantity of water into a reservoir of sufficient height to admit of its flowing out during the night in a small stream, with sufficient fall, so as to give motion to the engine; or by winding up a weight of sufficient size, or by many other means which are easily devised.

If, for instance, a room in which fifty persons slept was eighty feet long, twenty wide, and ten high, it would contain 16,000 cubic feet of air, and if this was to be removed twice in eight hours, it would require a cylinder of thirty inches diameter, working with a four-foot stroke four times in a minute, to do it; or nearly that. Such a cylinder could be worked by the descent of ten gallons of water ten feet in a minute; or, for the whole time, by eighty hogsheads falling the same height.

But this is a vast deal more than could be required, as the fifty people would, in eight hours only, vitiate three thousand gallons of air, which could be removed by one hundred and fifty strokes of a cylinder, twelve inches diameter, with a four-feet stroke, which would not require an expenditure of more than one thousand five hundred gallons of water properly applied, or about twenty-eight hogsheads.

JOHN TAYLOR.

Holwell, near Tavistock, Feb. 7, 1810.

CERTIFICATE.

Certificate.

An extract from the Report of the Committee of Management of the Tavistock Canal, to the General Meeting of Proprietors, held in August 1808, stating that great impediments had arisen from the want of good air in the tunnel when distant from a shaft, then adds—"For the purpose of rendering the ventilation in the tunnel completely good, and of doing it in a manner that may be applied to very considerable lengths in driving, the engineer has erected machines, acting upon the simplest principle, and without friction, which exhaust from the very place in which the men are working a continued volume of vitiated air; the place of which, of course, is as constantly supplied with fresh air, by the pressure of the atmosphere, and thus all difficulty on this head completely ceases."

Fifteen Guineas *were this Session voted to Mr.* Adam Reid, *of Green's End, Woolwich, for a Compensation Pendulum for a Clock. The following Communication was received from him. An explanatory Engraving is annexed, and a Model and Drawing of the Pendulum is preserved in the Society's Repository.*

SIR,

You will have the goodness to lay before the Society of Arts, &c. a half-second compensating pendulum of my invention;

Mr. Reid's Compensation Pendulum.

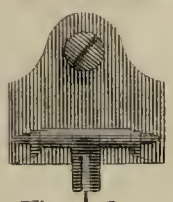
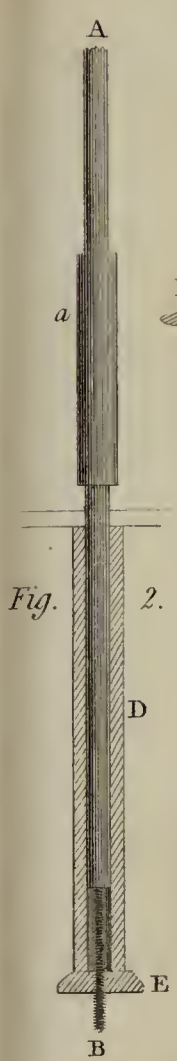


Fig. 1.



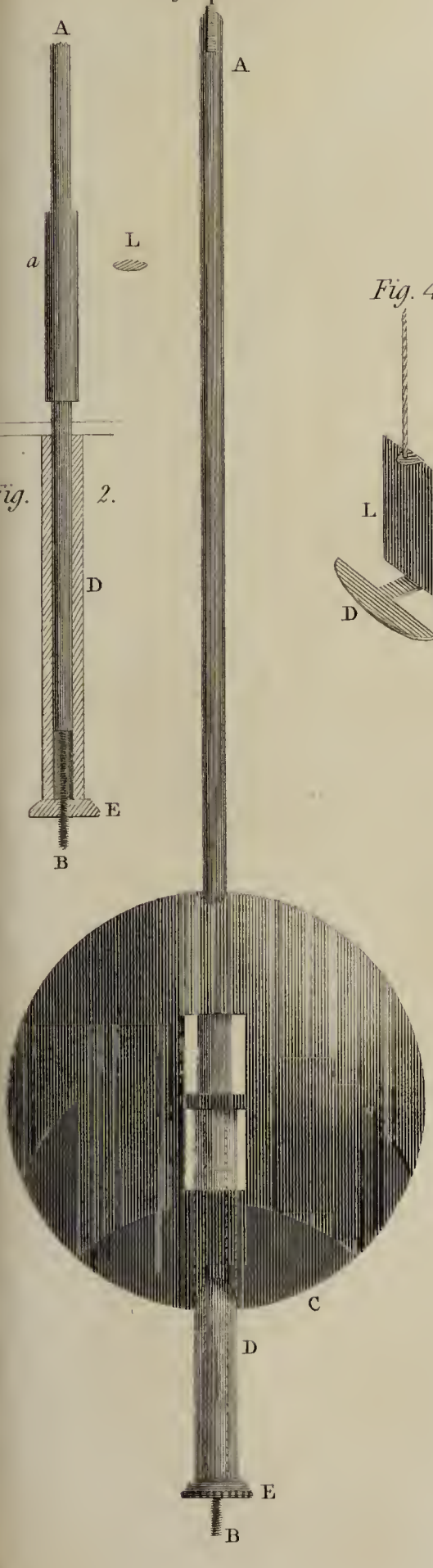
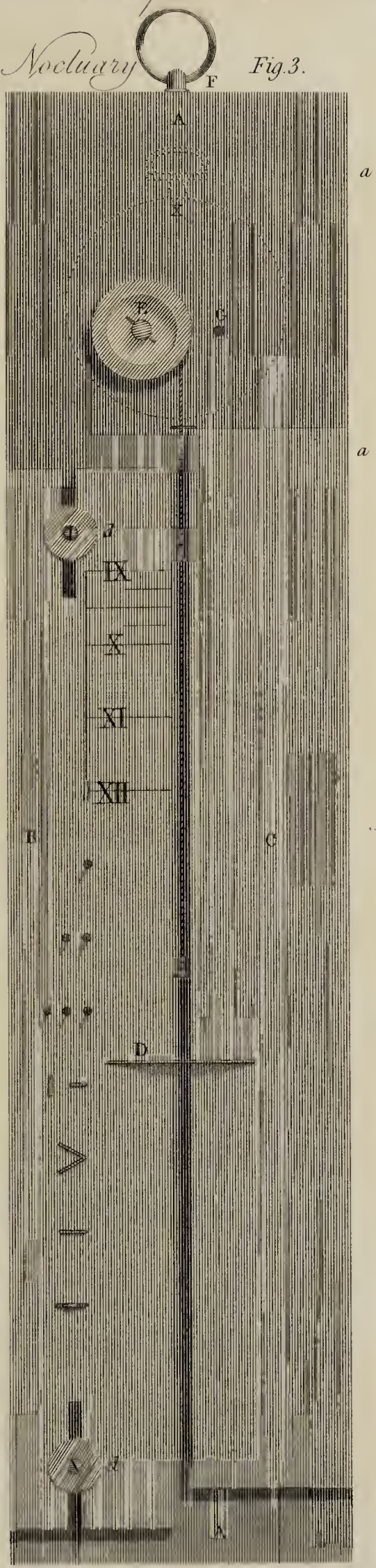


Fig. 4.

Mr. Sparks.

Nocturary

Fig. 3.



J. Torrey. Junr.

Engraved by S. Porter.

vention; which is so simple in its construction that it will be fully understood by viewing either the pendulum, or the drawing which accompanies it. I believe it to be new, and wishing it to be useful to the world, I have presumed to send it to the Society.

I am, Sir,

Your humble Servant,

ADAM REID.

To C. Taylor, M. D. Sec.

Reference to the Drawing of Mr. Reid's Compensation Pendulum, Pl. 14.

Fig. 1 and 2, pl. 14, A B represent the steel rod extending through the whole. C the bob, supported upon the compensating cylinder of zinc D, which surrounds the rod A B, and rests upon the nut E of a screw tapped upon the end of the steel rod, to bring it to exact time; as this expands downwards by heat, the zinc expands upwards the same quantity; so that the bob always remains at the same distance from the point of suspension. Fig. 2, is a section to explain more clearly the thickness of the zinc tube D, and the form of the steel rod at *a*, where it passes through the bob, which is of the shape shewn at L, that the rod or the bob may not turn round when the nut E is turned to adjust it to time.

The

The following Method is to be employed to make the Compensating Pendulum of Steel and Zinc.

Procure a rod of forged Blister-steel 52·7 inches long, ·27 diameter, heat it to a white heat which will open the pores of steel, and give it the smallest expansive power that steel of that texture is possessed of; when cold straighten it with a mallet of wood on a wooden block, that no part may be condensed partially, which would be the case if a hammer and anvil were used. Then cast a solid rod of zinc 12·5 inches long, ·68 diameter, with the lowest heat that will fuse it; pour it into a metal mould; this will give it the greatest density, consequently the greatest expansion that zinc is possessed of. Then bore a hole through the centre of it longitudinally, that it may move freely on the steel rod, which has a nut and screw at the bottom end to regulate the clock to time; the bob, as shewn in the engraving, rests on the upper end of the cylinder of zinc, and will continue in the same place, whatever expansion or contraction takes place, if the adjustment be correct.

If platina was used instead of steel, and steel instead of zinc, a pendulum might be made equally good, and more compact; but not at so small an expense.

The above dimensions are to be understood in the finished state of their diameters and lengths, proper for a second pendulum.

I have constructed a pendulum on this principle, which has been in use some months, and I have the satisfaction to find it has answered my expectations; the temperature of the room was from 58 to 84 degrees, and no variation of the clock, when compared with my other clock, which from many

many years trial, I know to be a good one, in a room where the thermometer does not vary more than four degrees.

The difficulty, or rather impossibility of making a good pendulum, where a compound metal as brass is employed, arises from the circumstance that neither brass nor any compound metal can be made uniform, not even for one foot in length; and then if drawn into wire the parts acquire a longitudinal grain, which adds to the variation of the expansive powers. To avoid this, zinc has been substituted, with no more certainty of success; for if a pendulum is made in the summer, and the steel pins fill the holes well, and it is exposed to a severe frost, and put to the clock for only a few years, the invisible fissures will become visible in the performance of the best clock, and a visible separation render the pendulum useless; as I have witnessed.

I am willing to furnish the Society with any further information in my power upon the subject.

ADAM REID.

Woolwich, April 27, 1809.

The SILVER MEDAL *was this Session voted to Mr.* G. SPARK, *of Elgin, Murrayshire, Scotland, for his Method of ascertaining the Hour in the night, by an Apparatus, connected with a common Watch. The following Communication was received from him. An Explanatory Engraving is annexed, and a complete Apparatus preserved in the Society's Repository.*

SIR,

BY Mr. John Newton, watchmaker, I have forwarded an invention for knowing the hour in the dark, by feeling. I think it preferable to a repeater, on account of its simplicity and cheapness. It is not liable to be out of order, and it does not require the exertion necessary for pushing the pendant of a repeater, nor disturb any person near it.

For these reasons I diffidently wish to have the honor of laying this invention, which I call a Noctuary, before the Society; and to be favored with their decision on its merits.

I am, Sir,
Your respectful and obedient Servant,
GEORGE SPARK.

Elgin, March 7, 1810.

To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. Spark's Noctuary, Pl. 14, *Fig.* 3.

A A, fig. 3, is a mahogany board, upon which two others, B and C, are fixed, so as to form a groove between and underneath

derneath them, in which the index D, shown separately at fig. 4, descends;—on the opposite side of the board a flap or door of mahogany is fixed, by two hinges *a a*, and a clasp; between this and the board A A, a cavity is formed to contain the watch, as shewn by the dotted circle X; the dial appearing through a circle in the door, a hole is made through the board A, opposite the fusee-square, to receive a key, upon which the small pully E is fixed, and from which the index D is suspended by a fine thread in the groove above-mentioned. It is plain that as the fusee-square and pulley E revolve, the index descends, and points out the hour by coming opposite the several marks, commencing at nine and ending at seven, which are fixed upon the board B; the marks, from twelve to seven, are made by pins projecting from the surface, so as to be readily distinguished by the finger; the index, represented in perspective at L, fig. 4, is made very light that it may not influence the motion of the watch. The watch must be wound up before it is placed in the frame, and the thread wound up on the pulley E, so much as to suspend the index nearly the height of the hour when it is set; the key is then pushed on the fusee-square, and if the index does not point exactly at the right hour, the scale B can be slided up or down to adjust it; the screws *d d*, which hold it, being fitted in grooves for that purpose; after this setting, the index will point out any succeeding hour descending a division at each. F, is the ring by which the instrument is suspended; and G is a hole in which the key on the pulley E is placed when the watch is removed, and the instrument out of use.

The SILVER MEDAL *of the Society was this Session voted to Mr.* J. WHITFORD, *Surgeons' Instrument Maker, St. Bartholomew's Hospital, for his Elastic Truss for Ruptures. The following Communication was received from him. An Explanatory Engraving is annexed, and a Truss preserved in the Society's Repository.*

SIR,

I HAVE taken the liberty of introducing to the notice of the Society an elastic steel truss, on an entire new principle, as to the curvature of the spring and form of the pad. Many alterations and improvements have been made in the construction of trusses; but none of them have been properly adapted to the curvature of the body before mine, which is made of a serpentine form, and passes on the ruptured side just below the outer edge of the christa of the ilium, as far as the posterior superior spinous process of that bone; it then goes straight across to the same point of the opposite bone, and pursues its course on the sound side of the pelvis in the same relation to the crista ilii, as it held on the side of the rupture as far as the anterior superior spinous process; where it terminates as usual in a leathern strap. In this mode of construction the motions of the trunk and thigh cannot derange the instrument, which acquires a still further stability from the extension of the spring round the sound side of the pelvis. The above anatomical description of the truss is taken from Mr. Lawrence's Treatise on Hernia, page 41. In addition to the improved spring,

spring, I have added a small projection on the pad, which has been found to answer most completely, as it causes a double pressure, the one on the aperture where the hernia descends, whilst the other part of the remaining pad adapts itself to the outer surface of the groin in the usual way.

I have likewise sent two springs, a double one and a single one uncovered, to show in what manner they are made. They are all in one piece except just at the neck of the pad.

I should have sent the trusses sooner for inspection, but I wished previously to try their effects to the fullest extent; which, I am happy to say, have answered my expectations in every respect. I hope, after it has been examined, I shall meet with the encouragement due to its merits.

I am, Sir,

Your most obedient humble Servant,

J. WHITFORD.

St. Bartholomew's Hospital,
Nov. 22, 1809.

To C. TAYLOR, M. D. SEC.

CERTIFICATES.

Mr. WILLIAM LAWRENCE, Demonstrater of Anatomy at St. Bartholomew's Hospital, in his Treatise on Hernia, 8vo. has given a very minute account of Mr. Whitford's truss, and its mode of application is fully explained therein by engravings; he states that he knows it has answered the expectation of the inventor, in some cases where the common trusses had been found inconvenient and insufficient.

Colonel THOMAS THORNTON certified, that being in the habit of taking the most severe exercise, he had been in

the course of wearing trusses as a means of prevention from accident; and that he never met with any truss that answered his purpose so perfectly as that made by Mr. Whitford.

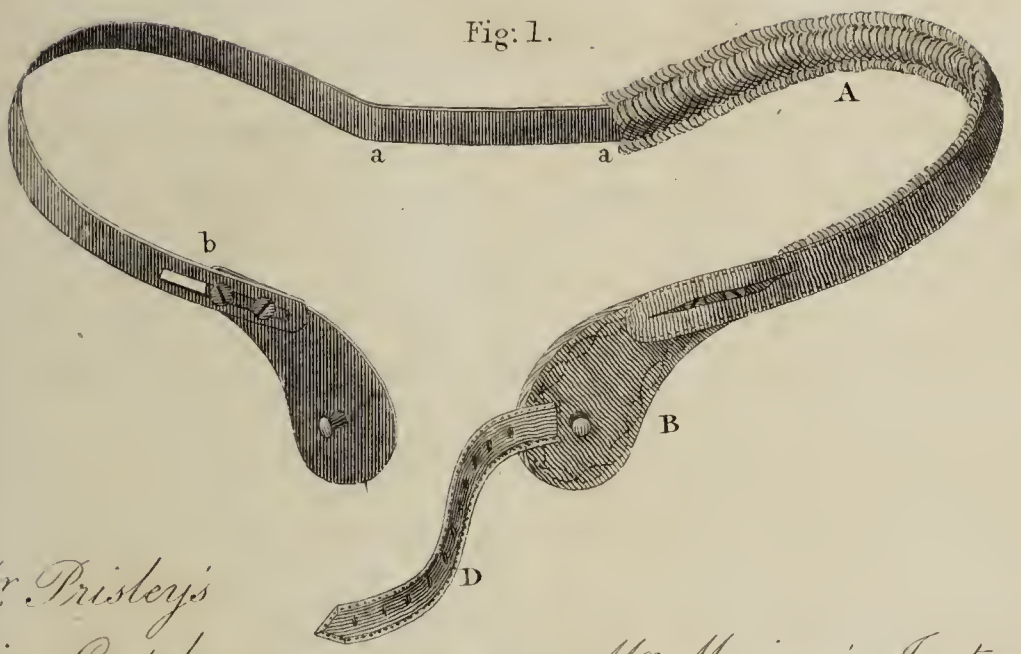
Mr. WILLIAM CHAMBERLAINE, Surgeon, Clerkenwell, declared that he is perfectly satisfied with the superiority of Mr. Whitford's truss; that he has accurately examined it, and approves of it *most highly*.

Reference to the Engraving of Mr. Whitford's Truss, Pl. 15, *Fig.* 1.

A double truss upon Mr. Whitford's plan is represented in perspective at the top of plate 15. One-half A is shewn covered, and furnished with its pad B; and the other half is the steel spring exposed, to explain the straight part at the back *a a*, for the purpose described in Mr. Lawrence's Treatise on Hernia; at *b*, the screws by which the pad can be separated from the spring are shewn; and being fitted in a groove, admit of a small adjustment of the pad to the proper position for any particular case; D is the strap, with a number of holes, to be hooked upon the pin projecting from the opposite pad.

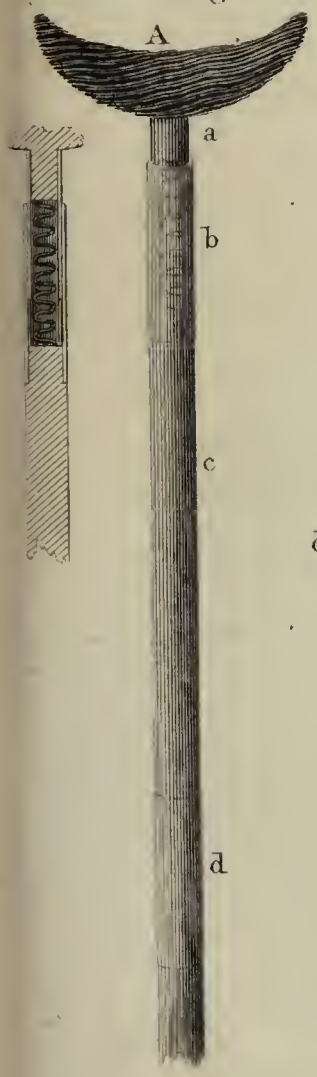
Mr. Whilfords Truss.

Fig: 1.



Mr. Prisley's Spring Crutch.

Fig: 2.



Mr. Morison's Instruments.

Fig: 3.

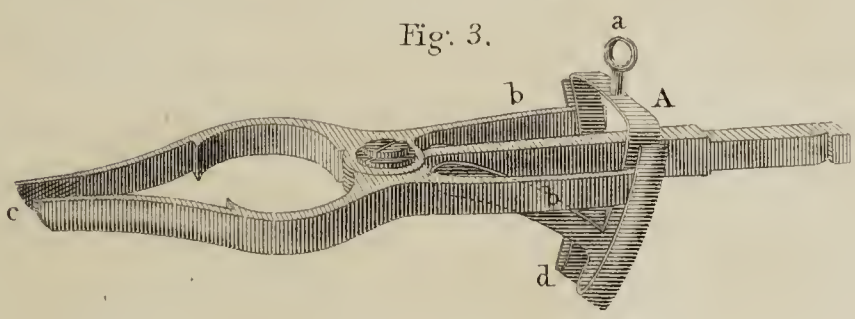


Fig: 4.

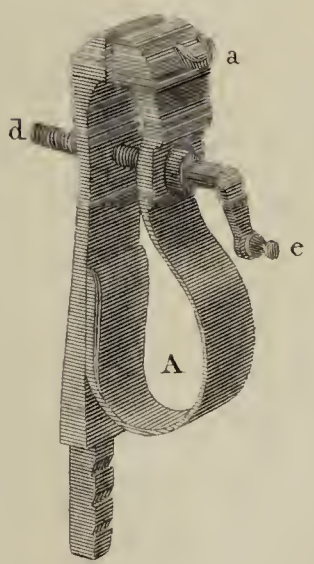


Fig: 5.

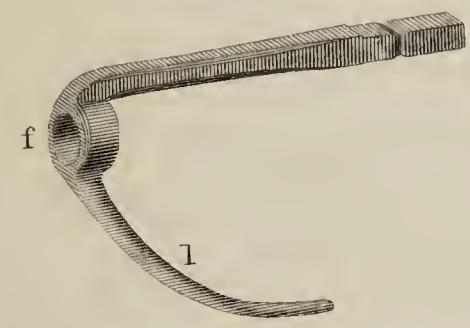
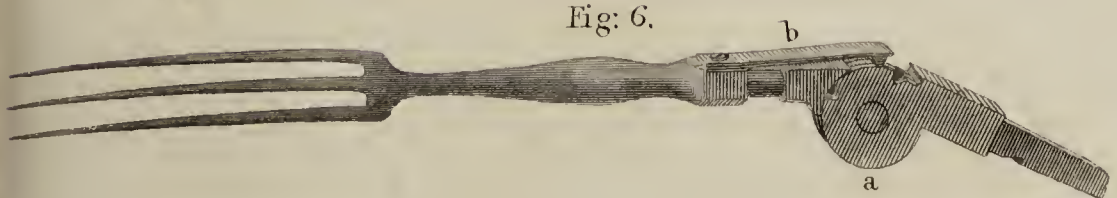


Fig: 6.



Drawn by J. Farey. Junr.

Engraved by S. P.

The SILVER MEDAL *of the Society was this Session voted to Mr.* GEORGE PRISLEY, *No. 3, Church-street, Soho, for his Method of constructing Crutches with Springs, to assist Persons who are lame to walk with greater ease. The following Communication was received from him. An Explanatory Engraving is annexed, and Crutches on this construction are preserved in the Society's Repository.*

SIR,

I BEG leave to deliver, for the inspection of the Society, my entire new invention of spring-crutches; which are strongly recommended by the faculty for the use of sick and lame persons.

By means of a spring within them they are more easy in use than common crutches; they are not liable to give such violent shocks to the person who employs them, and can be placed in a small bulk for carriage.

They are the first article of the kind ever offered to the public; and as they have met with the approbation of the faculty in general, I hope they will not be undeserving of the encouragement of the Society.

I remain, Sir,

Your devoted humble Servant,

GEORGE PRISLEY.

No. 3, Church-street, Soho,
London, Nov. 1, 1809.

To C. TAYLOR, M. D. SEC.

CERTIFICATES were received from the Earl of SHAFTESBURY; Mr. H. LEIGH THOMAS, Mr. I. C. CARPUE, Mr. S. HUNT, and Mr. FRANCIS KIERMAN, Surgeons; stating, that they had seen Mr. Prisley's spring-crutches, and strongly recommend them to public notice.

Reference to the Engraving of Mr. G. Prisley's Spring-crutches, Pl. 15, Fig. 2.

The head A of this crutch, (see fig. 2, pl. 15,) is fixed upon a short brass tube *a*, which is fitted to slide in another, *b*, fastened upon the top of the staff C; within the tube *a*, a spiral, or helical spring is concealed, which supports the head to be pressed upon, and which yielding in some degree to the pressure, the shocks which are experienced from the use of the ordinary crutches are avoided; at the same time a person can move quicker, and with less fatigue than in the common way; the staff C is made in two halves, which put together in a brass tube *d*, so that they can be divided for the convenience of packing; when the two halves are put together, a spring within the lower part of the staff pressing against the inside of the brass tube *d*, which is fixed to the upper half, prevents the danger of their separating by accident.

The

The SILVER MEDAL *and* FORTY GUINEAS *were this Session voted to Mr.* JOHN MORISON, *No.* 391, *Strand, opposite Cecil-street, for inventing a variety of Implements, by which Persons who have had the Misfortune to lose their Hands may usefully assist themselves. The following Communication was received from him. Explanatory Engravings are annexed, and the Implements described are preserved in the Society's Repository, along with Drawings thereof executed by him.*

SIR,

I SHALL esteem it a singular favor if you will have the goodness to present to the Society of Arts, &c. sundry instruments of my invention for the benefit of persons who have lost their hands. I had the misfortune to lose both mine on board the Atlas armed transport, of London, whilst in the act of loading a great gun to fire a royal salute in honor of his Majesty's birth-day, on the 4th of June, 1805, the said ship being then at anchor in the Cove of Cork. Since the above accident I have taken much pains to invent a variety of implements for the use of persons laboring under similar accidents; and it is my intention to manufacture such instruments as may be wanted by individuals requiring them for any particular circumstance that may occur.

Any

Any reward with which the Society may honor me will be gratefully accepted by,

Sir,

Your obedient humble Servant,

JOHN MORISON.

Sept. 7, 1809.

To C. Taylor, M. D. Sec.

A Committee was appointed on the 16th of November, 1809, by the Society, to consider the various implements invented by Mr. Morison, who, personally attending, stated, that he is a native of Aberdeen, and had lost both his hands and the lower parts of both arms a little below the elbow-joints, in the manner above-mentioned.

He produced to the Committee drawings of a great variety of instruments of his invention; and he informed the Committee, that the said drawings and the written explanations which accompanied them were wholly executed by himself.

He explained to the Committee the nature and uses of the several instruments which he brought with him; he unbuttoned and took off his coat and waistcoat in presence of the Committee, and put them on again and buttoned them without any assistance, and said he could entirely dress and undress himself, except the tying on of his neckcloth.

He showed one method of writing by his fixing a pen below his elbow, and a superior method by writing with a pen which he placed above his elbow; in both cases the writing

writing was very fair and clear, and executed with considerable facility.

He took up a glass and drank out of it, and used a knife and fork for carving and eating without any person assisting him.

He showed his method of receiving or paying money as occasion might require, and how to put the money into or take it out of a purse he had contrived for the purpose, and how to take up a small piece of money from the floor.

He can mend a pen by means of the instruments he has contrived, and can wash his face with a sponge placed and managed by himself.

He can use a punch and hammer for making holes in metal, and can work with a file.

He opened and shut the door of the Committee-room, and introduced to the Committee a person named CHARLES TOOL, who had also lost both his hands, and one arm above the elbow-joint; this man also proved to the Committee the comforts and advantages which he had derived from the use of Mr. Morison's instruments, and which answered better than those for which he had paid to other persons double and treble the price.

Mr. Morison stated, that the price of a good set of his instruments would be 10*l.* and that he manufactured them for sale; also trusses, bandages, and artificial legs and arms.

Reference to the Engravings of Mr. Morison's Apparatus, Pl. 15, *Figs.* 3, 4, 5, *and* 6, *and Pl.* 16, *Figs.* 1, 2, 3, *and* 4.

Mr. Morison having the misfortune to lose both his hands, was, from necessity, induced to contrive such instruments as might

might supply the deficiency as far as possible: in this pursuit he has met with great success, being now able to perform the necessary functions of life without difficulty to himself, or requiring assistance from others. It will perhaps appear surprising that a person thus situated should be able to write with great facility, and in a hand not larger than is often used for the common occurrences of business, and written with such apparent freedom, as could scarcely be thought possible. Mr. Morison has also made several very neat drawings (which are now in the Society's possession,) to explain the construction of a great variety of instruments which he has made at various times, and from among which those represented in the engravings were selected as being some of the most ingenious and useful in their application.

A A, fig. 1 of pl. 16, is a tube or socket, formed of strong leather, to receive the stump of the arm; it is open at one side next the open end, and has several holes to lace it on tight; but to prevent any danger of its coming off it is connected with a band B encompassing the arm above the elbow by two rings, one of which is marked *a*; the band is fastened by two double straps with a clasp: at the other end of the tube A a piece of wood is fitted in and faced with a circular iron plate; in the centre of this is a socket to receive the various instruments, one of which, D D, is represented in fig. 1; it terminates in an iron-hook D, useful for lifting any article, as a chair, &c. or drawing on boots; the other part of the instrument is made hollow to receive a button-hook E, and pen or pencil-holder F, either of which can be turned out for use, and are retained in positions of either shut or open by springs similar to that of a knife; behind these a knife G is placed, and can be opened out in a line with the instrument for use, or shut up within the instrument: *b* is a hook

to

Mr. Morison's instruments for Persons who have lost their Hands.

Fig. 1.

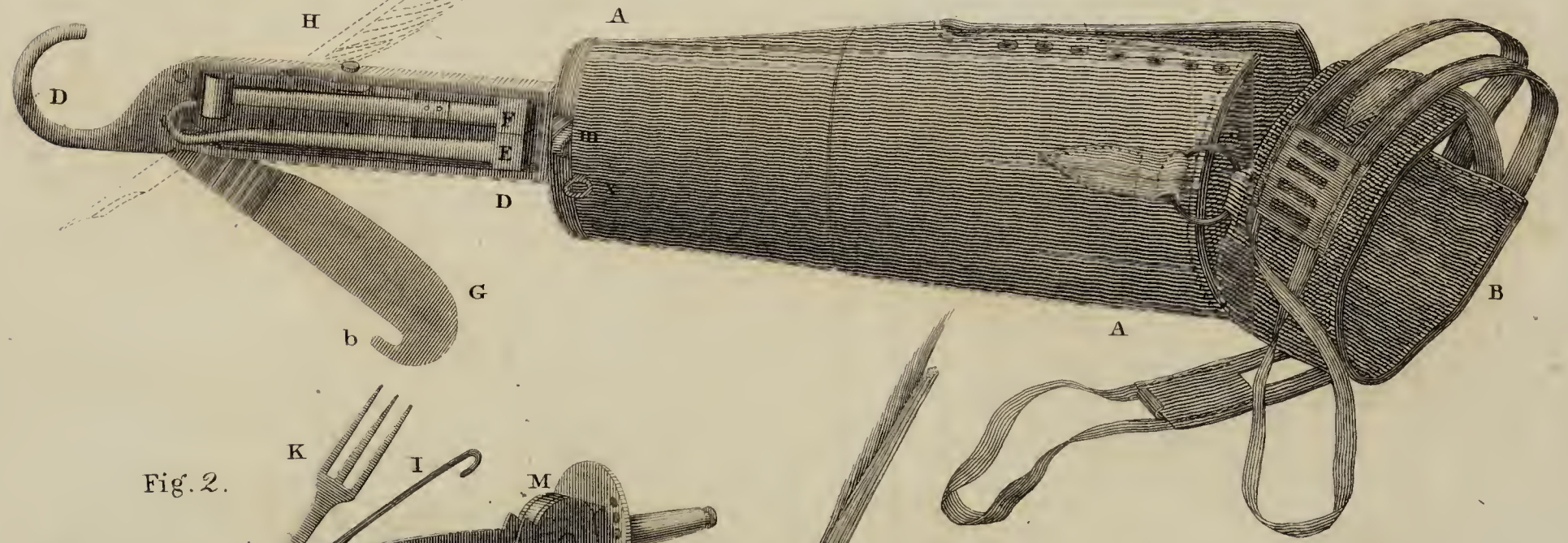


Fig. 2.

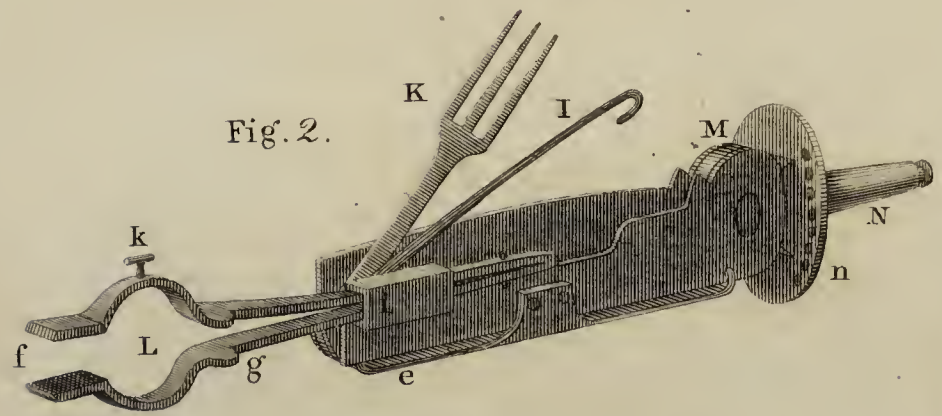


Fig. 3.

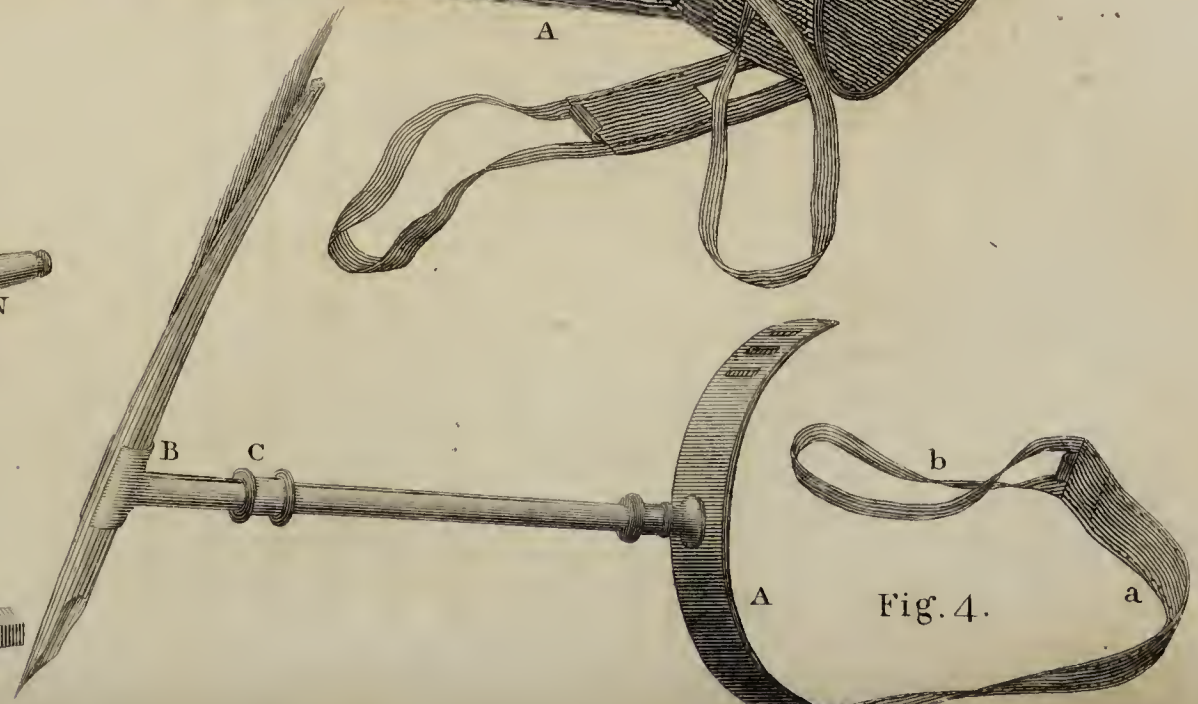


Fig. 4.

to open the knife by. The dotted lines H shew the manner in which a pen, or any similar instrument can be held, the springs of the button-hook and pen-holder being sufficiently strong to hold such articles. The instrument, fig. 1, is adapted to the right arm; the left is provided with a similar leather socket, into which the instrument, fig. 2, is fitted; it contains the button-hook I, fork K, either of which can be opened out for use; *e* is the spring by which they are held; L is a pair of spring-tongs, which slide through a socket *i*, and are by that closed up; they leave two pair of jaws, one at the end *f*, the other by the side at *g*; *k* is a small hook, by which the tongs can be opened by the button-hook of the other hand; the whole of the instrument, fig. 2, bends at a joint M, just where it joins the stump, and the end of the spring *e* catches in notches in the joint to hold it sufficiently firm at any particular point where it is set, by pressing the instrument on the knee, a table, or other fixture. N is the pin which enters the stump; it has a notch all round it at the end, into which a wedge in the stump is received to hold it in; this wedge comes to the outside of the leather at *x*, fig. 1, and has a hook by which it can be pulled by the button-hook of the other hand so as to release the instrument; this wedge does not, however, prevent the whole instrument turning round in the stump, but by means of holes in the circular plate *n*, and a spring-catch at *m*, fig. 1, which enters any of them, the instrument can be fixed in any position; the catch *m* is relieved by pressing it upon the table, &c. the instrument can then be turned round, but becomes fixed when the catch is at liberty. Besides the socket in the centre of the stump, a smaller one is situated in the end thereof, provided with its catch; it is used to hold several small instruments, some of which are represented; fig. 3 is a hook to take up a glass, or for hooking

hooking up light articles. Fig. 3, pl. 15, is a pair of tongs which are opened and shut by a double-inclined plane A, which moves on a centre by means of the button-hook introduced through the ring *a*; when this is moved it opens or shuts the tails *b* of the tongs, and produces a corresponding motion of the jaws *c* to grasp any small articles; these are very convenient, for by pressing the lower part *d* of the inclined-plane on the table, the tongs are closed without the assistance of the other hand, and by striking the ring *a* under the table they are opened again.

Fig. 4, of the same plate, is a small vice, its spring A acting to close it; it is opened by the hook *a*, and any article being put between the teeth is held lightly by the spring, then by turning the screw *d* by its handle the work is pinched fast: to turn this handle the hook, fig. 5, is put into the socket of the opposite stump, and the pin *e* of the vice being entered into the hole *f*, a rotatory motion can be given to the screw; the hook *l* is used to open the vice, and to move the work which is to be held therein. In this vice Mr. Morison holds a file, or other tool to operate upon any piece of work held in the bench-vice, the handle of which he moves by his knee; he has also a socket in which he can place a hammer or any other tool; this socket is inserted into the small socket of the stump.

Fig. 6 is a fork which is preferable to that in the instrument (fig. 2, pl. 13,) in its appearance, as it can be fitted into the small socket of the stump at the same time that an artificial hand is fixed in the centre socket, the fork having a joint *a*, with a spring *b* to hold it, can be bent as necessary, and the fingers of the artificial hand being brought to touch the shank of the fork, will have a natural appearance; one of the artificial hands is provided with a money-box in the wrist with a sliding cover.

Fig.

Fig. 4, of pl. 16, is a pen-holder fixed to a clasp A, which embraces the arm above the elbow, and is held on by a strap and hook-clasp *a*, to this a tape *b* is sewed to take hold with the button-hook and clasp it; by this means Mr. Morison can fasten this apparatus (as also fig. 1,) upon his arm without assistance, he prefers this pen-holder to that in fig. 1, and uses it in all cases except for signatures, &c. which would not be worth the trouble of fitting on the instrument fig. 4; the pen, in fig. 4, comes directly before the person using it, and is turned round when necessary in its holder B by the teeth, the sliding-ring C being drawn up tight to fasten it by the hook of the other hand; the manipulation of putting on this pen-holder is not easily described; the stem of B is held between the knees, whilst the clasp A is hooked as above-mentioned, by drawing the tape *b* tight over the arm; the ring *c* being slid back the pen is held in the mouth to place it in the holder B where it is fixed by the other hand: Mr. Morison uses a high table to write at, and the left hand is employed to hold the paper.

To pick up a pin or other small article the tongs of fig. 2 are used; if it is lying upon a table the jaws *f* of these tongs are placed on each side of the pin, and by pressing on the stump the socket *i* slides towards them, and closes the tongs around the pin: In some cases the side-jaws *g* are more convenient, the tongs must then be moved by the button-hook of the other hand applied to the hook *k*.

These are the principal instruments which Mr. Morison has invented, being chiefly such as he uses himself; but he has made a great number of others for different people in the same unfortunate state: for this purpose he has established a manufactory for these and similar articles, and adapts the instruments to the particular case and employment of his patients.

patients. Many of these instruments are in possession of the Society, where his address at all times may be had.

The Society's Rewards were presented to Mr. Morison by the hands of his Grace the Duke of Norfolk, the President, on the 20th of May, 1810, at which time SAMUEL HOMFRAY, Esq. of Glamorganshire, a member of the Society, then present, was so much pleased with Mr. Morison's ingenuity and exertions, that he conferred upon him a further gratuity of TWENTY POUNDS, for which sum Mr. Morison wrote a draft at Mr. Homfray's request.

PAPERS

IN

COLONIES AND TRADE.

In the present state of the Commerce of this Country, when our Enemies are endeavouring to close every Foreign Port against us, it is the Society's wish and endeavour to show the great Advantages and Resources which may be derived from our Colonies, and to give every Encouragement in facilitating their Efforts to furnish Articles which will answer the purpose of those usually derived from Foreign Kingdoms. Supplies from such being generally precarious, and procured at a great Expense to this Country.

In the Year 1786 Great Britain was almost wholly dependent upon Spain and France for the Indigo made use of in our Manufactures; the Imports of this Article from the East Indies at that period being only £.57,002 in Value.

By subsequent Encouragements given to its Product and Manufacture in our Colonies in the East Indies, the quantity of Indigo sent to London from thence has annually increased to an immense extent, being in the Year 1809 4,740,926 *lbs. weight, and in Value* £.1,105,678 *sterling; and this Country is now rendered wholly independent of any Foreign Power for the Article.*

The following Account of the Preparation of the Nerium Indigo, communicated by Dr. William Roxburgh, *of Calcutta, will be found interesting to the Public. Two Explanatory Engravings are annexed. Drawings of the several Plants mentioned, also of the Buildings and Apparatus necessary for the Preparation of the Indigo, are preserved in the Society's Repository.*

Account

Account of a new Species of Nerium, the Leaves of which yield Indigo, with an Engraving of the Plant, and Descriptions and Engravings of the necessary Apparatus for manufacturing the Indigo. To which is added, a brief Account of the Result of various Experiments made with a view to throw some Additional Light on the Theory of that Artificial Production. Also Descriptions of two other Plants which yield Indigo, and of one from Pegu, said to yield a Green Dye.

SINCE I wrote my first description of this tree, and of the process for manufacturing the indigo from its leaves *, many circum-

* These were sent to England 1790, addressed to the Honorable the Court of Directors of the East India Company, and since published by A. Dalrymple, Esq. in his Oriental Repertory. A copy of the same paper was sent to a friend in Calcutta, who thought it deserving the attention of the Supreme Government at Bengal, and submitted a Copy of it to the Governor-general and Council, accompanied by the following letter:

To EDWARD HAY, *Esq. Secretary to the Government.*

"SIR,

"Enclosed is an extract of a letter, dated June 8, 1790, from Dr. Roxburgh, of Samulcottah, accompanying a specimen of indigo obtained from the leaves of a tree, a native of the lower regions of the mountainous tract forming the Rajah-mundry frontier. This species of indigo, in the estimation of Messrs. Harris and Haven, promises to be a very valuable acquisition, and its value further enhanced from the consideration of its rising in a sandy or sterile as well as in a rich soil. That from being perennial (like the Sumatra species) and attaining to the stature of a tree, affording a permanent stock and unfailing resource against the devastations to which the culti-

circumstances, arising from innumerable experiments and repeated enquiry, have come to my knowledge respecting

vation of the more common annual different species of indigo (hitherto generally recurred to within the Company's Provinces,) are subject, being from their nature more exposed to failures from an unfavorable spring or disastrous season. From the annexed description of this tree, furnished by Dr. Roxburgh, it appears to be of the Genus Nerium, and will probably be found on our S. W. frontier.

"Of the seeds of this tree received, part have been sent to the collectors of Bhaugulpore and Gyah, and some hundred plants are now raising in the Company's garden, so that we shall be enabled to avail ourselves of this additional resource by a general distribution, during the present season, to the several indigo planters within the provinces, of which public notice may be given (on requisition being made) to take place in the course of the month of August, by which time we shall also be enabled to obtain a comparative estimate of its productive qualities, with the other species now in use.

"Should the avocations of Administration at any time permit them to descend to the examination of the situation and soil of the hilly tract, on which the residence of the collectorship of Hidgellee is situated, as described in the Diary of the tour through part of the tract in the year 1789, submitted on the occasion of an imperfect attempt to examine the maritime productions of that province, it will be perceived that that very uncommonly situated region is particularly adapted to the cultivation of this species of indigo. But I learn from the collector, that the greatest part of this tract (although in extent between twenty and thirty coss) is productive of little or no revenue to the *soi disant* possessor, the Ranny of ————; but I am wandering from the only subject which can entitle me to occupy the attention of the Board. The report of a new species of indigo brought under notice by the discernment and researches of Dr. Roxburgh, and I crave pardon for a digression from the subject into which I have been involuntarily led.

"I have the honor to be,

"&c. &c. &c."

[In consequence the paper was printed in Calcutta by order of Government, together with a very clear and satisfactory account of the method of making indigo from the common indigo plant, *(indigo fera tinctorea,)* as practised at Singatollah, near Malda.]

the

the tree, the process for preparing the indigo, its quality, &c. &c. such as to render a more complete account of it necessary, and which the quality of the indigo fully justifies, the more so, as quantities of the seeds of this tree were sent by me from the Rajah-mundry Circar to various parts of the world since the year 1790.

On St. Helena and the West India islands there is great abundance of soil and situation favorable to the culture of this tree, viz. hills, and the lower regions of mountains where there is little else than rocks, stones, and the most barren soil; such being the soil and situation I have always found it upon. One of the circumstances that have come to my knowledge respecting this tree is, that the natives of Vizagapatam and Ganjam districts, and some parts of the Carnatic, have been long acquainted with the quality of its leaves. Dr. Patrick Russell writes me from England, that among the papers of a most worthy sensible man, (an old college companion of mine,) the late Dr. George Campbell, who was a surgeon in this (the Madras) Establishment, and died of wounds he received in the action between the detachment under Colonel Baillie and Hyder Alley in 1780, there was found an account of the tree, and that the natives made Indigo from its leaves.

These circumstances were totally unknown to me when I first wrote upon the subject, otherwise I would have mentioned them at that time with as much readinese as I do now.

NERIUM.

Linn. Gen. Pl. Ed. Schreb, No. 420.

GEN. CHAR. *Contorted. Corol* funnel-shaped; mouth of the tube with a lacerated crown. *Follicles* two, *Seed* crowned with a coma.

NERIUM *tinctorium, Roxb.*

Arboreous, leaves opposite, short-petoiled, oblong, entire, smooth. Panicles terminal. Follicles pendulous, long, slender, united at the apex.—Anthers naked.

Thsil-ankaloo, of the Telingas.

Nerium indicum, siliquis angustis, &c. *Burm. Zeyl.* p. 167. t. 77.

An elegant middle-sized tree, agreeing perfectly in its botanical character with the Genus Nerium of the Linnean sexual system, and from the quality of its leaves may very properly be called *Nerium tinctorium*, which may be rendered dyers' rose-bay, for to me it appears a new species: it comes nearest to Nerium antidysentericum, *Linn. Sp. Pl. Ed. Willd.* 1 *p.* 1236, the tree which yields the Conessi-bark of our Materia Medica, Codaga-pala of the Hortus Malabaricus, *p.* 85, *t.* 47, Pala-cadija of the Telingas. They are both natives of the lower region of those mountains which bound the Rajah-mundry Circar on the north side, and are so much alike in most respects, the Nectarium excepted, that without a tolerable knowledge of both, the one may be mistaken for the other; and it is probable the bark of this new Nerium may have been gathered and sold for Conessi-bark, to which may be attributed the disrepute that has fallen upon Conessi bark in Europe; for with the natives in

these

these parts of India, it is deemed a specific in most complaints of the bowels, and I am inclined to think that it deserves a better name than it has hitherto acquired among Europeans.

DESCRIPTION.

Trunk—erect, short; in large old trees from one and a half to two feet in diameter, but when of that size it is generally full of large rotten cavities. *Branches*—numerous, irregularly disposed in every direction, and bent in various ways. *Branchlets*—opposite, round, smooth, and green; general height of full-grown trees from twenty to thirty feet. *Bark*—of the old wood scabrous, of the young pretty smooth and ash-coloured. *Wood*—white, close grained, very beautiful, approaching the colour and appearance of ivory. The natives employ it for a variety of uses, where a beautiful, light, close-grained wood is wanted. It is strong, and would answer well for furniture was it not apt to acquire a blueish tinge towards the centre. They (the Telingas) say, that if the bark of the tree is burnt off, by lighting a fire round it when first felled, that the wood will ever retain its whiteness and beauty.

Leaves—numerous, opposite, short-petoiled, oblong, pointed, pretty smooth, entire, pale green; when full-grown from six to ten inches long, and from three to four broad.

Stipules—none.

Flowers—about an inch and half in diameter, when fully expanded perfectly white, fragrant, disposed on lax, globular panicles at the extremities of the branchlets.

Bractes—a small oval one below each subdivision of the panicle.

Calyx—one-leaved, cup-shaped. *Border*—divided into five equal semiorbicular permanent segments.

Corol—one-petalled. *Tube*—short, somewhat gibbous.

Border—large, divided into five oblique linear-oblong spreading segments.

Nectary—many, ramous, white filaments crown the mouth of the tube of the corol.

Filaments—five, very short, rigid, inserted on the mouth of the tube just within the nectary.

Anthers—arrow-shaped, rigid, united to one another laterally, forming a very firm conical cover for the stigma; their lower parts are inwardly covered with fine white hairs.

Germs—two, seemingly united. *Style*—the length of the tube of the corol. *Stigma*—double, covered with transparent gluten, by which it adheres to the inside of the anthers.

Pericarp—two, very long, slender, pendulous follicles, united at both ends: singly they are from twelve to twenty inches long, and about as thick as a common pencil, consisting of one valve, which opens lengthwise on the inside.

Seeds—numerous, long, slender, crowned with a downy tuft, or coma, like the seeds of the common thistle. This tree and a variety of it with leaves considerably longer and narrower, and somewhat downy, which also yield Indigo, but of an inferior quality and less in proportion, are natives of the hills and lower regions of the mountains, directly north from Coringa, in the Rajah-mundry Circar, and delight most in the south, or sunny side of these hills and mountains. It (meaning the variety figured and described, which yields the best indigo,) also grows in simi-

lar

lar places in other parts of the Circars, and in the Carnatic, being an extent of above one thousand miles in length, and of breadth uncertain ; it contains a mild milky juice, chiefly in the tender branches and young leaves, which flows out on being wounded. Near inhabited places it is so often cut for fuel, that in such situations it is almost ever found in the state of a very small tree or large bush. It is in uninhabited parts, or where well protected, that we find it becomes a tree of any size.

But to make the trees yield a large supply of the best leaves for making Indigo, it is necessary to keep them low, as found in the vicinity of the habitations of the natives, or in the state the mulberry plantations, for feeding silk-worms, are kept ; with many shoots issuing from the out-stumps. These in one year acquire various heights, of from one to ten feet, according to the nature of the soil, &c. and are thick in proportion.

The leaves drop about the beginning, or during the cold season. In March and beginning of April, they begin to make their appearance, and soon after them the flowers. By the end of April, those that began first to be unfolded, will have attained their full size:—This is the proper time to begin to gather them for making Indigo. About the same time it ceases flowering, and many of the seed-vessels are fully formed ; but the seeds are not ripe till January or February.

The color which the leaves acquired in drying for my hortus siccus, particularly if they happened to be bruised, first induced me to suppose them to be possessed of colouring matter, which numerous experiments and much enquiry have fully confirmed.

Apparatus

Apparatus for Manufacturing the Nerium Indigo.

The quality of the leaves of this tree differ most essentially from those of the common Indigo plant, in not yielding their color to cold water. Every method has been tried that could be thought of, and with various kinds of water, viz. rain-water, soft-water from the well, river-water, and with various kinds of hard water, but all without any good effect; for with cold water I never could procure any other than a very small proportion of a hard, black, flinty substance, which does not deserve the name of Indigo, burning with much difficulty and with a white smoke, into dark colored ashes; whereas that made with hot water, burns readily with a most beautiful, deep, violet-colored smoke, and a strong peculiar smell, into fine white ashes.

Not being able thus to succeed, after a great variety of experiments, conducted in various ways, and at different periods during three years, I conclude that it will be only loss of time to attempt it longer; some other person may be more fortunate; but I have at all times found that they give out their colour most readily to hot water; it therefore becomes necessary for those who intend to carry on this manufacture on a large scale, to have works differing very much from those by which the common Indigo is generally made.

The most essential part of the business consists in applying a sufficiency of fire, at the least expense;—In general I found the price of the fuel was nearly equal to every other charge. I will describe what seems to me to be the best; yet I have no doubt that others, better acquainted with the method of applying fire to the greatest advantage, will soon contrive a better, and on this, in a great measure, will the success of this new manufacture depend; I must, therefore, beg

beg leave to recommend all possible attention to this point, which I have the more reason to do; because, by this scalding process, I have always, on a small scale, made from the common Indigo plant, better Indigo than I could by fermentation, in one-fourth of the time, and what is also of much importance, without the smallest degree of that pernicious effluvia, which attends the manufacturing of Indigo by fermentation. The twigs and leaves of the common Indigo plant themselves, after being well dried, make a fierce fire, and will in general nearly suffice to carry on the work without any great quantity of additional fuel. The Nerium works have not this advantage, the leaves only being scalded there.

In my first experiments, in 1789 and 1790, I used the common earthen pots of the country to scald the leaves in; but for many obvious reasons, large copper vessels are infinitely superior. They may easily be made of any size of sheathing copper, rivetted together and soldered. I conceive that ten or twelve feet, from the fore part, where the scupper is fixed to the back part, is as much as one fire can well act upon; their extent the other way must depend on the distance they are to be carried, and mode of conveyance to the place where they are to be used. I should suppose five or six feet to be sufficient; if more, it will be very troublesome to move them without injury. Their depth ought not, I conceive, to be more than two feet, in order to avoid overscalding the leaves near the bottom, before those near the surface are sufficiently scalded. Round the edges, on the inside, must be nailed a frame of wood, to support them; on the middle of the forepart, close to the bottom, there must be a scupper of length sufficient to pass through the wall, into a channel, which may be constructed of brick and lime to carry the liquor into the agitation cistern. These

scuppers

scuppers may be stopped with wooden spiggots, or brass cocks; the latter would be more convenient. Any number may be arranged side by side, and if made to communicate with each other near their bottoms it will be convenient, as the water when filling them running in at one place, passes equally into all, without farther trouble; and the sides of the vessels touching each other, do not then require support. Whereas their outsides must be supported by a wall, which must have vent-holes for the smoke, and to give a free circulation to the air in different places to make the fire burn. These vessels must be placed upon strong square bars of iron, at about a foot asunder—their ends supported by the wall, which is to support the outsides of the vessels, and their middle, by small pillars. The great weight of the vessels when filled, requires that this part of the work should be substantial, and the more so, if the vessels are made of sheathing copper. These bars of iron must be placed high enough to give room for the fire under the vessels to act with the greatest force. One fire to each will be found sufficient, and for that, one opening on the side from whence the most prevailing winds blow, must be left for feeding the fire, and removing the ashes. These arches, or openings for the fires will, according to my plan, come immediately under the channel for conveying the colored liquor from the scalding vessels to the agitation vat. Grates, for the fires, would be expensive; they may be made on the floor, a little raised above the level of the adjacent ground, (suppose the works in the open field), and with a small ascent from the fore to the back part, which makes the fire burn better.

The agitation vat may be built of brick and lime, as usual in common fermented Indigo works, never more than three feet in depth, but broad in proportion to the number and size of the scalding vessels employed. Six of them, for example,

example, of the size afore-mentioned, will require the agitation cistern to be about twenty feet square, and three feet deep. In the sequel, it will appear that the blue color of Indigo is derived from the air. It is, therefore, necessary to make the agitation vat, or cistern, very broad, and never deep; eighteen or twenty inches in depth is as much as it ever should be. The other, sixteen or eighteen inches above the liquor, may be called the border, and will not require to be so strong, as it is only to prevent the liquor from splashing over during the agitation.

On the edge of the agitation vat may be placed, or built, a small cistern, perhaps five feet square, to make and hold the lime-water; if this is made to exclude the air entirely, so much the better;—for the action of the air on lime-water soon weakens it so much as to render it of little use; this is an essential point, and ought to be attended to. The principles upon which lime-water is decomposed by exposure to the open air, were first explained by the immortal Dr. Black, and are now too well known to require any explanation from me.

The scupper from this lime-water cistern, must be considerably above its bottom, to give proper room for the undissolved lime to settle in. A shade ought to be built over the scalding vessels to shield the labourers from the intense heat of the sun, but not over the agitation vat; for I have never found rain to do it any harm, and the more it is exposed to the light, open air, and wind, the better. It would be well to keep the surface of the liquor gently agitated by the wind during the time the fecula is precipitating, for it prevents the copper, or violet scum, from forming, which should not be allowed, as it in a great measure prevents that free absorption of the coloring principle, which is derived from the atmosphere, and probably assisted by the contact

of

of light, and not from the plant itself. It is only the base of the commodity which the leaves yield. It is also necessary that the works be erected in a place, where no dust can be raised by the wind; such places are common amongst jungles, &c. where this bush generally grows.

Another small cistern, or receptacle for receiving the fecula (blue precipitate) drawn off, will be very convenient. There it settles to the bottom, when still much of the parent liquor may be drawn off by scuppers, which renders the draining in the bags, or on the table, much less tedious. The bottom of this cistern ought to sink towards the centre, where a small excavation should be constructed for the purpose of taking up the last of the fecula with more ease, and for sand, and other heavy impurities to settle in. Over this small cistern the draining bags may be hung, till the liquor runs clear from them.

Method of Manufacturing the Nerium Indigo.

The leaves in these parts of India, as I have already observed, begin to be fit for making Indigo in the month of April, and in May and June, * I have found them to yield a better colour than in any other month. About the end of August the growth of the plant begins to draw to a close for the season, the leaves acquiring a yellowish rusty colour, soon fall off, without being succeeded by others, or in a trifling

* The hottest time of the year. In the shade the thermometer, during the heat of the day is generally above one hundred, often from one hundred and ten to one hundred and fifteen, and exposed to the sun (nearly perpendicular). On the rocky barren soil, where these bushes grow, it rises between one hundred and forty and one hundred and fifty, an astonishing heat for vegetables to flourish in!

degree,

View of the Nerium Indigo Works, as practised at Hindostane.

Nerium Plant.

Fig. 1.

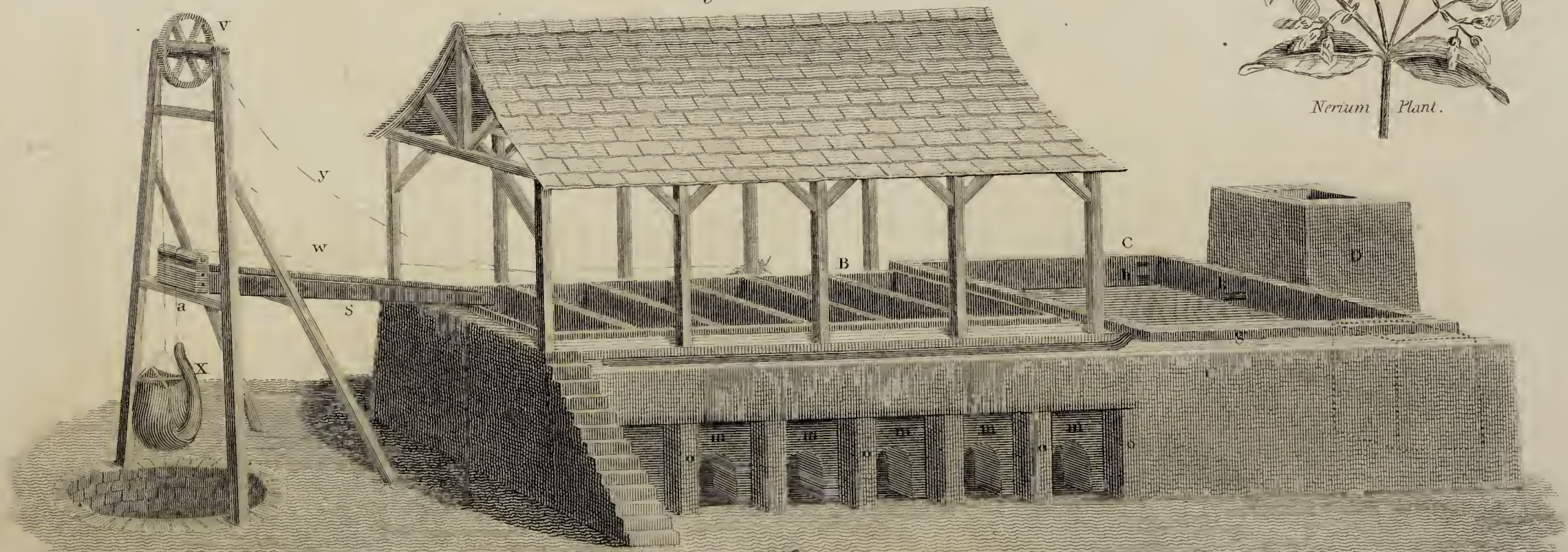


Fig. 2.

degree, till next season, so that here with the plants in a wild state (which is the state I always allude to in these observations) I can only reckon the length of the season for making the Indigo at four or at most five months in the year.

The leaves of the plants raised from seed in my garden, did not yield colour till several years old, and then but in a trifling degree, and of a quality inferior to what the old wild plants do in their natural soil. It is the same with the young plantations in Bengal. If the leaves are culled, and only the best chosen, the Indigo is considerably more beautiful than when taken promiscuously, with the extremities of the branches, where some (the lowermost on the shoots, will be rather too old, some at the extremities too young, and those on the middle part only of a proper age. I could never extract any thing like blue Indigo from the tender shoots of this plant, when deprived of their leaves. Many trials were made, and in various ways *, because I considered it of importance to determine this point, that care might be taken to prevent the labourers from plucking them, which they will always do, if not strictly watched, because they can fill a basket, or measure, by which they are purchased much sooner, if permitted to bring the twigs along with the leaves, than if leaves only are taken, and the manufacturer will find it necessary to attend particularly to this, otherwise they will always gather the twigs with the leaves upon them, which will diminish the produce of Indigo, and

* This is not the case with the twigs of the common Indigo plant; for in several experiments with rain-water, soft well-water and hard-water, I always easily and readily extracted from them, even when deprived totally of their leaves a tolerably good Indigo, though inferior to what was procured by the same process from the leaves alone. That from the twigs being much more darkly coloured.

debase

debase its quality. However, it will be almost impossible to pick only the leaves excepting when the work is upon a very small scale. All that can be done, in extensive works, is to prevent the twigs from being brought. Leaves of all kinds may be taken, particularly if the work is begun early in the season, before any become so old as to be hard and yellowish. These leaves have this advantage, that they may, without injury, be kept for some little time. I have tried this in various ways, and for various periods, up to their being perfectly dry; and found that they give the best Indigo when kept a day or two. After that, when they begin to wither, they yield but a small portion of very bad Indigo, and when quite dry, only a dirty brown fecula. I have been attentive to this point, because the leaves of the common indigo plant bear drying, and keeping without any loss of their quality. It is the practice in some parts of India to dry them before extracting the Indigo. I was desirous to find that the same could be done with the leaves of this tree, because, when dry, they might at much less expense be transported from one place to another; I must, therefore, confess that I was sorry at the disappointment. This appears to me to be the second essential point in which they (the leaves of nerium and indigofera) differ in their properties. I consider the first to be their not yielding their colour to cold water, or but in a very imperfect degree.

The leaves being collected, for instance, on the preceding day, are put into the coppers, or other vessels, in sufficient quantity, (full) but not pressed down, and then the vessels are filled with cold water *, to within two or three inches of the

* I have tried all the sorts of water that I could conveniently procure, viz. rain-water, soft water from wells and from a river; and various kinds of

the top, and so much must be left, because here the bulk enlarges by the heat, fully as much as the common Indigo vat

of hard water. The last I have generally found to give the best Indigo, and in the largest proportion. The hard water that answered best, has the following properties:—

1.—It is from springs more or less deep, according to the level of the ground, and is very common along the skirts of the mountains, where the nerium grows. Our wells, in the garrison of Samuleotah, are of the same quality; and, during the dry season, are from forty to fifty feet to the water.

2.—It is naturally very clear when undisturbed.

On being heated it appears full of bubbles, as if boiling, while not hotter than the hand can bear. Fifty pints of this water was evaporated to dryness, in a very clean, wide-mouthed brass vessel. During the evaporation, the surface is covered with an ash-coloured granulated cream, and a white sediment is early formed. When reduced to about three or four ounces, it becomes of a brownish colour, and had a saline sweetish taste. In this state it was suffered to remain all night, with a view to discover if any crystalization would take place, as the form of the crystal might better lead to a discovery of their nature; but nothing of the kind took place, I therefore concluded all the salts to be deliquescent. The precipitate, which was gray, like powdered lime-stone, fermented briskly with the diluted mineral acids. During the fermentation with vitriolic and nitrous acids, it emits a strong muriatic smell. The whole being evaporated to dryness, it weighed two hundred and twenty grains; in a moist atmosphere, it absorbs as much water as renders it nearly liquid, making a good hygometer.

3.—Lime-water renders it instantly milky, and causes it to emit much precipitate. Pure caustic, mild alkalis and soap have the same effect; only with this difference, that in soap it is rather a flaky feeula, which is long suspended in the water. But lime-water which has been digested on Prussian-blue, produces no change, which not only proves the total absence of iron, but that the nature of the lime-water has been entirely changed by the blue.

4.—Mineral acids do not cause any change.

From the above analysis, though very incomplete, I do not hesitate to assert, that the cause of hardness in these waters is chiefly, if not entirely, owing to the calcareous matter, held in solution by an excess of fixed air. The other saline substances are in a very minute proportion; a small por-

vat does by fermentation. The fire is then lighted, which must be maintained rather briskly till the liquor acquires a deep green colour when viewed in the vessel; but if taken up, and poured from one vessel into another, it will appear of a pale, but bright greenish-yellow; the leaves will then begin to assume a yellowish colour, and the heat of the liquor will be of about one hundred and fifty, or one hundred and sixty degrees of Fahrenheit's scale. Little dependence can be placed on the copper, or violet scum, as the leaves must be constantly agitated, and turned upside down, to produce, as nearly as possible, an equal degree of scalding, if not those at the bottom would be much overdone before those at the surface were ready. The motion answers another purpose, it serves to expel the fixed air, which greatly forwards the operation. The fires must be withdrawn, or suffered to die away, some little time before the liquor has acquired the above-mentioned appearance; and it is necessary to have all the different vessels, that are to be let into the same agitation vat, ready at the same time: a little practice will soon render this easy of performance. When they are ready the whole is drawn off at once. A contrivance must be made to let the liquor pass through a hair-cloth (a coarse Comly, such as the poorer classes of the natives wear in cold weather, answers remarkably well) to prevent any of the leaves, &c. getting into the agitation vat with it. As soon as the whole is run off, it must be, while hot, agitated in the common way for a few minutes; from five to twenty will generally be found sufficient to produce the necessary degree

tion of marine acid, I conceive to be the acidifying principle, which accounts for the deliquescence of the whole. It is well known that a certain proportion of fixed air, renders these substances (calcareous) insoluble in water. A farther addition (an excess) dissolves it, but it is again readily decomposed by heat, &c.

of

of granulation. About from one-seventieth to one-hundredth part of strong, pure lime-water, is then let in (the liquor being still hot) from the lime-water cistern, which requires only to be sufficiently mixed with the liquor, to produce, quickly, a very large grain, which soon precipitates. The supernatant liquor is then let off, and the rest of the process is exactly as in making the common fermented Indigo.

If the process has been properly conducted, the supernatant liquor will run off of a clear Madeira wine colour, which is a sign that it retains none of the Indigo; and the produce of Indigo when dry, will average about one pound from every two hundred and fifty pounds of the green leaves; but varies according to the season and state of the weather when gathered. By the end of August, or September, they have not, with me, yielded much more than one-half, or two-thirds of the quantity which they give in May and June; and even that is diminished if the weather is wet, or if the leaves are committed to the fire immediately when gathered.

The operation was with ease performed twice a day, indeed it might be done three times. The scalding of those large vessels, to the degree already mentioned, requiring only about three hours, and the agitation and precipitation not m ore; so that by the time the scalding is completed, the fecula of the preceding operation is ready to be removed from the large agitation vat, into the small square cistern, where it is to remain until the fecula has precipitated into a still smaller bulk. The supernatant liquor is then let off by scuppers, and the fecula put into bags to drain.

M. De Cossigny, in his treatise on the cultivation and manufacture of Indigo, observes, that it is much improved if the moist fecula is washed with warm water, in which a

small quantity of the acid of vitriol has been mixed, which may be affirmed also of this Indigo; I would, therefore, recommend the practice, when the acid can be had on reasonable terms. A small quantity will suffice; the use of the acid seems to be to dissolve any remains of the calcareous precipitant, or other extraneous matter that may unavoidably be mixed with the fecula; all of which ought to be farther washed off, by one, two, or even more subsequent washings with pure water; if hot, the better. The marine acid, I have found to answer nearly as well, but as it is weaker, of course to produce the same effect a larger quantity must be used. The nitrous acid did not, with me, produce effects so good; and it rendered this Indigo porous.

No doubt, these washings reduce the produce much; but the beauty and value of the Indigo is greatly increased. Of different samples of this Indigo, which I sent to London, those that had been so treated, were valued at one-fourth more than the same Indigo that had not been washed. This, with the difference in the freight, caused by the greater value of the Indigo, will, I trust, be sufficient to induce manufacturers to give this, regenerating, or improving part of the process, at least a fair trial.

This Indigo, when good, is very friable, it no sooner begins to be dry, than it breaks down into small pieces, even without being touched; for this I have not yet found any remedy (it requires one, as this diminishes its value when brought to market), except that of drying it very slowly in a cool shade, where the sun has no access, for the more it is exposed to his beams, the more friable it becomes. Several parcels of nerium fecula dried quickly in the most powerful sunshine, where compared with other parcels of the same fecula that had been dried very slowly in a cool dark shade; there was no difference in the colour, but the

first

first had fallen into small pieces, whereas most of the second that had been dried slowly in the shade remained entire.

With respect to its quality, it is necessary to observe that, samples have been sent to London, to the Honourable the Court of Directors, to James Amos, Esq. of Devonshire-square, and to different merchants and brokers, and all agree in declaring it to be of excellent quality. Among others, I sent twenty-five different samples to Mr. Forbes, of Aldermanbury, whose broker had them valued by eminent dyers; the price they put upon the worst was four shillings the pound; and on the best, eight shillings and sixpence. The following extract of a letter from H. Harris, Esq. dated Calcutta, July 9, 1791, furnished another proof of its excellence. "I cannot help taking the first opportunity of informing you of the report made to me by my broker, on the samples of Nerium Indigo, which you sent me, viz.: That they had been shown to two eminent dyers, who said that they could pronounce without any trial, that the quality was of a very superior nature, and as good, if not better, than what they had ever seen from India; and that it would be an excellent substitute for Spanish Indigo, and was worth, at that time, eight shillings per pound. I sent the samples by the Houghton Indiaman, and my letter from England is dated January 30, 1791."

The quantity that may be made annually will, of course, now become the next object of inquiry. I have already observed, that the tree, or bush, is found in great plenty about the hilly and mountainous parts of the Circars and Carnatic; so much so, that from what I have seen and heard from others, I may safely venture to say, that any quantity of the Indigo may be made; as a proof of this, I need only observe, that from the 15th of May, till the 15th of August,

1792, I caused to be made from the bushes that grew on one hill; the base of which might be from two to three miles in length, and about one in breadth, no less than between seven and eight hundred pounds weight, the worst of which (and there is but little of this sort) is worth from five to six shillings per pound. The greater part is equal to the sample which was valued at eight and sixpence; and there is a considerable part of it, which was brightened by the acid of vitriol, considerably finer, I conceive worth ten shillings. The apparatus with which the above Indigo was made was such as I have already described, and found to answer well.

I shall now conclude this, the practical part of my paper, with observing, that I have been as minute on every point as my knowledge of the subject permits, with a view to encourage others to undertake the manufacturing of this kind of Indigo in preference to the common kind. It is infinitely more profitable, and (what may seem paradoxical to assert) employs infinitely a greater number of hands in gathering, and bringing the leaves, cutting fuel, &c. which with every man of feeling will be an object in a country where thousands of poor miserable creatures are constantly in a state of starvation for want of employment. The whole of the expense, excepting the first price of the copper for constructing the scalding vessels, goes to the labourers; and what is still more, the old and infirm—the young and feeble can, with ease to themselves, procure a comfortable subsistence by picking the leaves from the bushes, which is the most tedious part of the work, and requires the greatest number of hands, while the stronger are employed in carrying the leaves to the works, cutting and bringing fuel, &c. In short, it seems an object very deserving of the attention of Government. It is in every point of view an object of

great

great magnitude; for, admitting over the whole of the Company's possessions on this canal, only two hundred and fifty Nerium Indigo Works, each making four thousand pounds of Indigo in the season, amounting in all to 1,000,000 lbs.*; which, without exaggeration, may be valued here at two current rupees per pound, and will bring the whole to be equal to 2,000,000 current rupees; half of this sum may be supposed to go for the labourers, which may absolutely be deemed a *charitable donation*; the other half goes for the first cost of the works, and for the manufacturers profit. Hence a source of wealth hitherto unknown, raised in the most laudable and politic manner, and without encroaching on one foot of land that ever has been devoted to other purposes; raised too upon a soil that never can be cultivated, I now speak from experience, not conjecture, which, however, was not the case when I wrote my first account of the tree: I therefore said but little. Now, when I know the quality and the value of the Indigo; the quantity that may annually be manufactured, and the rate at which it can be made, even when entrusted to the management of the natives, to which a necessary attention to many other objects obliged me to have recourse; I say now, when I know these circumstances, I can, with more certainty pronounce

* It appears, from an account published at Paris in 1770, that St. Domingo alone exported annually 2,000,000 lbs. of Indigo, which paid export duty. I may, therefore, conclude that the above calculation is fairly without bounds; for the extent of the country on this coast (Coromandel) where the bush grows, is greater than the whole of the island; and, I have no doubt, that it grows in still greater abundance on the Malabar coast, which is more mountainous, and of course more favourable to the growth of the plant. I have lately been informed that Dr. H. Scott, of Bombay, discovered it growing upon the Island of Salsette.

the manufacture to be a profitable, as well as a laudable pursuit.

The information rendered by Mr. Harris's broker, deposes farther, that two eminent dyers in London, said, *that it would be an excellent substitute for Spanish Indigo.* Mr. Dalrymple, who published my first account of the tree, writes me to the same effect. It is therefore to be hoped that when this Indigo is produced in abundance, Spanish Indigo will be thereby superseded.

This species of Indigo possesses farther advantage. It is well known that the common Indigo plant can be brought to perfection only on a good soil, and by laborious and expensive culture; even then it is liable to many accidents from changes of weather and other causes. I have not discovered that this species of Indigo is subject to any disease; nor have I ever observed a leaf eaten by any insect, or other animal, except goats and buffaloes; and it is only hard necessity that will force them to eat it; for I rarely observed any of the shoots or leaves to have been touched by them, although I have often found large droves of both feeding among the bushes.

A brief Account of the Result of various Experiments made with a view to throw some additional Light on the Theory of this Artificial Production.

In conducting these experiments I confined myself entirely to such as cannot be well practised in Europe, because none of the Indigo plants which I have used grow spontaneously there. For although they can be caused to grow,

grow, yet the climate being so different from that where they are found indigenous, their juices must be weak, and very unfit for yielding good Indigo; such experiments are therefore inapplicable to them, not so with the Indigo itself, for it can be had every where equally good: I therefore avoid touching upon it, as it can be analized by those who are possessed of far more ability for so arduous a task; indeed it is with great diffidence, and with some degree of reluctance, that I have ventured to communicate the result of my experiments on the theory of this manufacture, because I am perfectly sensible of my own inability. My remote situation from the seat of science renders my knowledge of the late improvements in chemistry, particularly of the gases, or aëriform fluids, very limited; and my apparatus for conducting the experiments are at the same time extremely rude.

M. De Cossigny, if I rightly understand, supposes volatile alkali to be the agent or medium by which the colouring matter is extracted from the plant, and held in solution until volatilized by the agitation process:—None of my experiments countenance this theory.

I have lately seen an extract from another ingenious French author, M. de Irom la Cautour, who thinks that the odorous principle of the plant acts the part of M. de Cossigny's volatile alkali. This principle is too fugacious and transient for me to pursue.

Mr. Robert Blake, of Calcutta, in a short paper, supposes the colouring principle to be held in solution by the aërial carbonic acid. If he means the base of the Indigo, which is furnished by the plant, his opinion agrees with my experiments. Mr. Blake was induced to make the experiments that led to the above theory in consequence of the opinion of Mr. Charles Taylor, of Manchester, that this acid was absorbed

absorbed from the atmosphere during the agitation. Mr. Taylor, in his report to the Lords of the Committee of the Privy Council for Trade, &c. says:—"The use of the violent agitation in the second process I think has never been clearly ascertained in any account I have seen respecting Indigo; its theory certainly depends upon the great attraction which Indigo, in that state of solution, has for fixed air; by agitation and exposure to the atmosphere it absorbs it from common air, and unites with it, and is thereby precipitated. The success of this part of the business therefore will be increased by such improvements in mechanics as will expose the coloured liquor with the largest possible surface to the atmosphere, that the affinity may sooner take place, and in procuring a great circulation of common air in and about the reservoir."

In so far Mr. Taylor and I coincide, that we both recommend the exposure of a large surface of the coloured liquor to the atmosphere, and a free circulation of air, which indeed is one of the main objects aimed at.

When the common Indigo plant is committed to cold water in the steeping vat, the appearances are as follows:—In a few hours, more or less, according to circumstances, a slight motion begins to pervade the body of liquor in the vat; the bulk increases considerably, with some additional heat; air bubbles are generated, some of which remain on the surface; these gradually collect into patches of froth—a thin violet or copper-coloured pellicle or cream makes its appearance between the patches of froth: soon after the thin film, which forms the covering of the bubbles that compose the froth, begins to be deeply tinged with fine blue. The liquor has, from the beginning, been acquiring a green colour, and now it will appear, when viewed falling from one vessel into another, of a bright yellowish green,

and

and will readily pass the closest filter, until the action of the air makes it turbid; a proof that the base of the colour is now perfectly dissolved in the watery menstruum. This is the time for letting off the vat; if suffered to remain the bulk begins to diminish and returns to its original dimensions; however the fermentation continues: there is still much intestine motion through the vat, and large quantities of froth is formed. Hitherto the peculiar smell of the plant prevailed; but now it becomes very offensive, something like that of animal matter beginning to putrify; as fermentation goes on the smell becomes more and more offensive, and the quantity of air discharged less and less, till absorption takes place.

For my experiments I used a cask of sixty-three gallons, which I filled two-thirds with the plant, in the state similar to that in which it is directed to be taken to make Indigo, and filled it to within a few inches of the top. To the mouth or bung-hole of the cask I occasionally applied a glass tube, which was always removed immediately after I had collected sufficient air to make the necessary experiments, in order that the external air might have free access to the fermenting mass; that being one of the conditions necessary to promote fermentation. It is unnecessary to detail the periods at which the experiments were made, because the fermentation takes place sooner or later, according as the vessel has been lately employed for the same purpose or not; the reason of this is obvious, and well known to the manufacturers of this commodity as well as to those of wine, rum, and vinegar. During the first part of the process, if a wet bladder is tied over the mouth of the tube it is strongly pressed in by the external air, a sure proof that the vat in this state absorbs air; but as soon as the bulk of the mass begins to be enlarged, a disengagement of airs takes place; these are fixed,

pure

pure and impure, about the time that the bulk of the vat is greatest, the fixed air is discharged purer, and in larger quantities than at any prior period, and even it continued to predominate up to the ninth day, which I call the last stage; but as the fermentation advanced a little beyond the stage at which the vat is to be drawn off, a little agitation was necessary to promote a sufficient discharge of the airs to fill a bladder or two. I tried every means I could invent to detect the volatile alkali that I was led to expect, but without the smallest appearance of success at any time; fixed air was ever present, and in a large proportion, consequently alkaline air could not form a part of these airs without producing white clouds, and a precipitation of mild concrete volatile alkali *.

Not satisfied with this proof, I at various times threw into these airs, confined in inverted glasses, sometimes over water, and at others over mercury, marine acid air, without ever observing the least cloudiness to be produced in consequence.

A farther proof is, that when the nitrous air was thrown in, to prove the presence of pure air, nothing like a white cloud was formed, which would have taken place had alkaline air been present, forming nitrous ammoniac. These proofs are more than sufficient to determine the non-existence of alkaline air; for no two bodies rush into combina-

* In the Appendix to vol. 79 of the Monthly Review for 1788, there are some extracts from the second edition of Dr. M. DE LA METHERIE's Analytical Essay on pure and other species of air; the book itself I have not seen. In treating of fermentation he divides it into two species, one forming *compounds*, as that which produces wine, bread, vinegar, &c. and in vegetables and animals elaborates their juices, and forms of them an astonishing variety of different substances; the other species of fermentation are acid, pure, inflammable, and impure; no notice is taken of alkaline air in these extracts, till speaking of the putrid animal fermentation, during which the airs discharged are acid, pure, impure, inflammable, ammoniacal, and sulphureous.

tions

tions with such rapidity as the alkaline and acid aëriform fluids During the agitation process, fixed air continues to be discharged, mixed with pure and impure airs, but still nothing like volatile alkali, (alkaline air). As soon as the grain appears distinctly, the precipitant (alkaline or calcareous,) is added. From that instant an absorption of air takes place, and after the liquor has settled a little, a candle will burn freely close to its surface as long as it would have done in the same quantity of atmospheric air, which before went out at the instant it entered the mouth of the vessel.

The same experiment was repeated several times on a smaller scale, in bottles of four gallons, and led to the same result.

I also repeated them with nerium leaves; but the fermentation was never so perfect with the common Indigo plant, yet the airs discharged were the same, though in less quantity.

Scalding the common Indigo plant (young twigs and leaves) or the leaves of Nerium in the above-mentioned four-gallon bottles, produces nearly the same effects, viz. first, an absorption of air, then an increase of the bulk of the mass, with a discharge of pure air at first; then it becomes mixed with the fixed air, but in a smaller proportion than in the fermenting mixtures; here also during the agitation much fixed air is discharged, till the grain is formed and the precipitant added. Then, as before, absorption takes place, and, as in the other, a lighted candle burns freely near the surface of the liquor after the precipitant is added; and once I observed distinctly some explosions of inflammable air. If the liquor was agitated previous to letting down the candle into the vessel, it was extinguished at the instant it entered its mouth.

I have determined, as far as my abilities and apparatus permit,

permit, the nature of the airs that are discharged during the solution or extraction of the base of this substance (Indigo,) from the leaves of indigofera tinctoria, and nerium tinctorium, as well as during the whole of the agitation process, an operation which renders this base insoluble in its former solvent, and at the same time separates it from the other extractive matters which have been drawn from the plant by the same menstruum, and which fortunately still remain dissolved, their nature and attractions being different.

I shall now proceed to remark what takes place when the coloured liquor, charged with the green vegetable base of the Indigo, is excluded from the action of the open air, and farther impregnated with the aërial acid.

I took the coloured liquor without being in the least agitated, with which I filled the globe of Dr. Nooth's apparatus for impregnating water with fixed air, into which I continued to throw that fluid from a fermenting mixture of powdered lime-stone and diluted vitriolic acid. For some hours no change ensued. Standing till next morning a very few grains of a greenish precipitate were found in the bottom of the vessel, which I impute to the communication which the liquor had with the open air before being deposited in the globe; for when the leaves had been scalded in bottles of water inverted in a large vessel of water, or in the globe itself, and committed to the same trial, no grain was found; the liquor remained uniformly of a pale yellowish green, which is the colour it always acquired in my experiments when scalded in the above manner; I kept some full bottles of it inverted in water for a month, and no change took place, nor did the liquor, under any of these circumstances, ever acquire the copper coloured film on the surface; but as soon as the air is admitted to it, greenish blue veins are soon observed to descend from the surface in various directions

directions until the whole becomes blue; this phenomenon is constant, but the colour is more or less deep, according to circumstances; and soon after a precipitation of blue grains takes place, and the copper-coloured pelicle appears on the surface *.

The experiments were varied with leaves of both Nerium and the common Indigo, and with different kinds of water; the same effects were constantly seen; no change in the colour of the liquor took place, nor was any grain formed, while the external air was perfectly excluded; neither did the leaves acquire that offensive smell which they have when exposed to the action of the air. I may therefore, and I think safely, conclude, that fixed air is not the agent by which this colouring matter is separated from its menstruum, but rather that by which it is extricated from the plant and held in solution.

Nitrous air from iron-filings and diluted nitrous acid was also, by means of Dr. Nooth's apparatus, thrown into the coloured unagitated liquor for some hours, without producing any change, except that here the violet-coloured film took place; this liquor was afterwards exposed to the open air, and the changes which thereupon took place were as usual.

Inflammable air from iron-filings and diluted vitriolic acid deepened the colour of this liquor much, and it was quickly covered with much deep violet-coloured scum, but no decomposition took place till the atmospheric air had access to the liquor; it then became quickly a deep greenish blue, and let fall a considerable proportion of precipitate, which, on drying, turned out to be the most beautiful Indigo. Inflammable air from dried sheep's-blood burnt in

* Some little of any of the usual precipitants always forwarded these changes.

a gun-

a gun-barrel, as recommended by Dr. Priestley, had not the same effect as that from iron-filings and vitriolic acid; the change of colour being less deep.

Alkaline air, from a heated mixture of three-fourths of quick lime and one of sal-ammoniac, deepened the colour of the liquor fully as much as the first-mentioned sort of inflammable air did; it gave a deep violet-scum and good Indigo, after exposure to the open air, but nothing like a separation took place before.

I proceeded in the next place to try the effects of calcareous and alkaline agents on this coloured liquor, still excluding the air; for this purpose I put into bottles portions of the leaves of both plants, to which I added rain water, impregnated with a large portion of what I have always found the most powerful precipitants, viz. lime-water, caustic ley, stale urine, Prussian lixivium, and phlogisticated calcareous lixivium, (the nature of which will be taken notice of hereafter); the bottles were inverted in a vessel of water and scalded to the usual degree; the effects were, that all become only of much deeper colour than when no precipitant was used; but nothing like a separation of the colour took place until exposure to the action of the air.

These experiments were also repeated with different sorts of water, and at different times of the year, with the same success. I also scalded the leaves in an open vessel, and as quickly as possible, so as to allow the air the least time to act on the liquor. I put it into bottles, to which portions of the same precipitants were added, and immediately inverted the bottles in a vessel of water. After standing sixteen hours, a little green or olive-coloured fecula, (precipitate) was found in each, which I conclude to have arisen from the little action the air had on the liquor when scalding, and in pouring into the bottles. This precipitate when

separated

when separated and exposed to the air became Indigo of rather a bad quality, and the liquor from whence it was separated, on exposure to the air, became blue from the surface as usual, and soon gave a blue precipitate of tolerable good Indigo. These experiments clearly prove that the most powerful precipitants, added to these liquors, cause no decomposition without the help of the open air; and farther, that if the air has had access to it while scalding only, a very small quantity of green or olive-coloured precipitate may be produced, which does not acquire a blue colour without the free contact of the air. They also prove that the colouring principle of Prussian blue does not act on this coloured liquor any farther than the alkali to which it is united would have done by itself. It is therefore to be presumed, that both the base and the colouring principle of Indigo are totally different from those of Prussian blue.

I shall now proceed to offer such observations on those agents, or mediums, called precipitants, which are generally employed to extricate any remaining fixed air, which may still adhere to the grain after the best conducted agitation, or, as it is commonly called by the manufacturer, to help to form and precipitate the grain. The coloured liquor impregnated with the first principles of the drug, (its base), whether acquired by fermentation or by a scalding heat, will, without the least of our assistance, if only exposed to the open air, and particularly if with a large surface, in a short time begin to part with its colour, which will fall to the bottom in minute grains of fine blue Indigo: agitation will hasten the separation and precipitation much, and cause the produce to be larger. Heat has nearly the same effect, though in a less degree, except when joined with agitation, in which case the two act more powerfully than either alone. The Indigo procured by all these means is good if the process

has been properly conducted; precipitants are not therefore absolutely necessary for the production of Indigo, but if well chosen, and in a proper proportion, they forward the operation much, causing a larger produce than could be had without them, and I have reason, from a variety of experiments, to say, that the quality is by no means injured in consequence. How long precipitants have been in use I cannot say; however it appears from an account of the European Settlements in America, printed in London for R. and J. Dodsley, in 1760, said to be compiled by Mr. Edmund Burke, that the practice of employing lime-water to facilitate the granulation and precipitation was common at that time in America.

So far as I know, these precipitants are universally calcareous, alkaline, or astringent vegetable matters, of which lime-water is the most common; and I believe it is also the best, particularly with Nerium. Alkalies answer the best when made caustic, that is, when deprived of fixed air; but even then lime-water gives a purer Indigo, though probably not in quite so great a quantity. It has been already observed, that fixed air forms a very considerable, I may say the largest portion of the airs that are discharged during the fermentation, scalding and agitation—a fluid for which lime has the greatest attraction. Bergman gives the first place to pure ponderous earth, which I believe some eminent chemists doubt; however all agree in this, that lime holds the second, if not the first place; and upon this principle I conceive the idea of its superiority as a precipitant; for I have every reason to believe that the colouring base of the Indigo is held dissolved by this acid, and the more it is deprived of it, prior to the addition of the precipitant, the more perfect is the granulation, and a much smaller portion of lime-water (precipitant) then answers perfectly well.

Next

Next to lime-water may be reckoned caustic ley, made from vegetable alkali and quick-lime; this generally gives more precipitate, but the quality I found to be inferior to that by lime-water under similar circumstances. I have observed that this ley, when perfectly caustic, throws down some of the other extractive matters of the plant along with or before the blue. If the ley is added before the liquor has been agitated, or before any granulation has taken place, these extractive matters will generally be precipitated first, in form of a dirty pale yellow fecula: in the mean time the supernatent liquor gradually acquires from the surface a deep blue colour, soon becoming turbid, and lastly the blue precipitate of real Indigo will be formed over the first. This proves the impropriety of using a caustic ley where Indigo of the best quality is wanted, which appears to me to be the unequivocal object of every manufacturer. This ley changes the unagitated green liquor into a brownish colour, which quickly becomes blue: these changes are quick, and require an attentive eye to mark them. When this ley is made less caustic, which may be done by using a lixivium of wood-ashes and lime-water mixed, it gives a better coloured precipitate nearly as good as lime-water. At first I supposed this to be the best agent, but farther practice has convinced me that lime-water alone, or phlogisticated calcareous lixivium, are both preferable.

Stale urine is also a powerful agent; the colour of the Indigo precipitated by it is always very bright, but considerably lighter-coloured than with lime-water or caustic ley.

In consequence of observing that inflammable air acted favourably on the coloured liquor, I was induced to prepare and try the Prussian, or phlogisticated lixivium, in various proportions and in various ways; but I could not discover that it proved a better agent than the alkaline ley alone, and in general it was inferior to lime-water; besides its

action is slower: but as I found the caustic ley to be inferior to lime-water, I suspected that the inferiority of this lixivium might be owing to the alkali itself; I was therefore induced to try to incorporate this principle which the alkali receives from the blood, or other animal matters during the calcination with quick-lime. With this view I took equal quantities of unburnt shells in powder, and sheep's blood, and made them up into balls, and burnt them as I would have done the shells alone; with this I prepared a lixivium, which I call phlogisticated calcareous ley, No. 1. I also took equal parts of quick-lime and dried blood in powder; these I calcined together in an open iron ladle until they ceased to emit flame or smoke. With this I prepared another phlogisticated calcareous ley, and to distinguish it from the first, I marked it No. 2. To prove whether these leys contained any of the animal matter, (whether called tinging, inflammable, &c.) I digested some lime-water on powdered Prussian blue until it became of a straw colour, and lost the characteristics of lime-water; I then dissolved a small bit of green vitriol in rain water, which I divided into four equal parts, Nos. 1, 2, 3, and 4: to No. 1, I added twenty drops of pure lime-water as a standard: No. 2, had an equal portion of the lime-water that had been digested on Prussian blue; No. 3, the same number of drops of my phlogisticated calcareous ley. No. 1 and 4, the same number of drops of the ley No. 2. All but No. 1 gave a green precipitate; No. 3 gave rather more than No. 2, and No. 4 more than No. 3. But the colour No. 2 was infinitely brighter than either No. 3 or 4, there being much ochreous matter mixed with them. These two phlogisticated calcareous leys I tried as agents with the coloured liquor of both sorts of the Indigo plants, both before and after agitation, in various ways and proportions, and in general I found that they gave Indigo rather better

than

than lime-water alone. No. 2 I found the best; but after all I do not think this ley could ever be conveniently and cheaply made in sufficient quantities to produce benefit sufficient to induce any one to take so much trouble, independent of expense, as is necessary to prepare it. However I think these experiments prove that the colouring principle of Prussian blue is very different from that of Indigo.

With these phlogisticated agents I have always observed that the supernatant liquor, from whence the blue is precipitated, remains of a much darker greenish or olive colour than when any of the other agents were employed, which implies that there is still much of the base kept dissolved, (by unextricated aërial acid); yet here the produce was fully as great as any of the other precipitants gave with equal portions of the same liquor. At the same time their supernatant liquors proved of a clear brandy or Madeira wine colour. When a green or olive supernatant liquor follows the use of lime-water or caustic ley, (which is too common in making Indigo by fermentation, to the great loss of the manufacturer,) I conceive it to be owing to the presence of fixed air still adhering to and keeping dissolved a portion of the base, this fluid not having been sufficiently extricated by the fermentation, or scalding, extent of surface, agitation and action of the agent employed *.

From a supernatant liquor of this colour, (dark green or olive,) a farther precipitation may be obtained by the same means as used in procuring the first; and it will be found, when dry, of as dark or a darker colour than the first, but

* "This opinion of Dr. R. does not seem well founded; there is much more reason to conclude that from some cause or other the vegetable basis of the Indigo in this case has not attracted and united to itself a sufficient portion of oxygene, on which its blue colour most certainly depends."—Dr. Bancroft, p. 440.

considerably duller: I never obtained a light blue, except by the means of particular agents; the best of these was soap, if the water in which the herb was scalded or fermented was hard. For if soft or rain water no precipitation takes place with soap. A solution of tin in aqua regia, in a very small proportion, gives a large produce of light blue precipitate. In the northern parts of the coast of Coromandel the natives use a cold infusion of the bark of *Eugenia Jambolana* or *caryophyllifolia* *, very powerful astringents to precipitate their Indigo, which they always extract from the leaves by hot water; they have no idea that Indigo could be made with cold water, nor is it necessary to inform them, for what they make is of a very good quality. I have tried a number of other vegetable astringents, but without any good effect; the principles upon which these act I cannot venture to describe.

The mild vegetable, mineral, and volatile alkalies prove also precipitants, but inferior to those already mentioned. Mineral acids in a small proportion added to the coloured liquor, before or even after agitation, do not prevent the precipitation; but I cannot say they forward it, of course cannot be reckoned agents, or in other words precipitants. Solutions of iron, lead, tin, mercury, and copper, either injure or entirely destroy the colour; tin, if only a very little of the solution is used, gives a light blue fecula of considerable beauty, particularly while moist.

I have also repeatedly tried a very great variety of other substances and various mixtures, not only as precipitants, but to wash the precipitate with, without finding any that can be compared with lime-water for the first, and pure or clear vitriolic acid for the second: it is therefore unnecessary to

* "*Calyptranthes Jambolana* and *caryophyllifolia*."—Linn. sp. pl. ed. Willd. vol. ii. p. 975.

mention

mention them here. I will only state alum, which I have found a most powerful agent, but it debases the quality of the Indigo. With the liquor of Nerium leaves, which had been much scalded, just beginning to boil, it gave a pretty large quantity of green precipitate, which retains its colour after being dried. I have not tried the quality of this green, except as a pigment with water on paper, and it is about as good as Reeves's sap-green; how durable it will prove time must determine *.

From the result of the foregoing experiments I may presume to draw the following conclusions :—

1.—That the two plants afore-mentioned, from which this substance is prepared, yield only the base of it. It is naturally green while it remains dissolved in its watery menstruum, by which it was extracted from the leaves, leaving them of a dirty yellow colour.

2.—That much fixed air is disengaged during the extrication of this base from the leaves which yield it, and is the agent, or medium, by which it (the base) is probably extracted, and kept dissolved in its watery menstruum, and farther, that water naturally impregnated with this acid, and calcareous matter is more capable of extracting a pure colour from Nerium leaves than when not so impregnated.

3.—That to procure a blue (precipitate) Indigo of the best quality from this menstruum, or coloured solvent, such means are quickly to be taken as are known to be most effectual for weakening or destroying that attraction, which fixed air has for this vegetable base. These are heat, exposure to the open air, (solar light,) and agitation, to which may be added such agents as are known to have the greatest attraction for this acid, (fixed air). These are quick-lime and the caustic

* To this discovery I suspect the Barasset, *green Indigo*, may be traced.

alkalies, or their solutions *. The aërial acid, by these means, will gradually quit the base of the Indigo, part flying off by means of heat, exposure to the air and agitation, the rest, (or as much as may be sufficient,) uniting with the calcareous or alkaline agent, forms lime or a mild alkali; the former insoluble falls to the bottom, while the latter is soluble and remains suspended in the liquor: by these means the vegetable base of the Indigo being now completely disengaged unites more perfectly with its colouring principle, which it greedily absorbs from the atmosphere, (and is probably assisted by the action of solar light,) forming therewith a coloured insoluble fecula, which soon falls to the bottom: this precipitate, washed and dried, is Indigo. I cannot certainly determine what this colouring principle is, but suppose it to be Dr. PRIESTLEY'S dephlogisticated air, now called oxygenous gas, pure or vital air. I have already observed, that the natives throughout the Northern Provinces, or Circars, make all their Indigo by means of hot water, which I call the scalding or digesting process, and precipitate with a cold infusion of an astringent vegetable bark; yet, notwithstanding the inferiority of their agent, (which habit has rendered sacred,) when its effects are compared with those of lime-water, which I have often done, their Indigo is constantly found, when not intentionally adulterated, of a very excellent quality, and very light, a cubic-inch weighing only about one hundred and ten grains, the colour blue violet. The superior quality of this Indigo must alone be imputed to the nature of the process by which the colour, (or rather the base of the colour,) is extracted from the plant; for their apparatus is most inconvenient, being only

* I have not been able to procure ponderous earth, otherwise it would have been tried.

common

common earthen pots, which hold about four or five gallons each. In these the fresh tops and leaves of the common Indigo plant are scalded, to a degree a little above what is necessary for extracting the colour from Nerium leaves. They pay little attention to the nature of the water, provided it is clear. Their agitation-vat is only a large jar. The rest of the process is similar to that in common use, but throughout they are very careless, so much so that it is astonishing to find the excellent Indigo which they make in this rude manner. An indubitable proof that the scalding process is superior to fermentation for obtaining good Indigo.

In many parts of the Carnatic they also extract the colour by the same means, hot water; but debase the Indigo, by adding a large quantity of a mixture of red earth and water, which they employ as a precipitant.

These observations on the mode of making Indigo, by the natives of the coast of Coromandel, are given with a view to recommend to our manufacturers the scalding process, in preference. The apparatus for the common plant, may be exactly such as I have described for Nerium; and if they are erected where the Nerium grows in plenty, they can be employed during the hot or dry months on this plant, which is then in season; and during the wet and cold seasons on the common Indigo plant. By this means their works, and what is of more consequence, the labourers, will seldom be without employment; for the land adjacent to the hills, where the Nerium grows, is generally of a good quality, and of a gravelly nature, which suits well the growth of the common Indigo plant during the rainy and cold seasons.

Besides the superior quality of the Indigo, the scalding process has other advantages, the chief of these which present themselves to me, are:—

1.—The

1.—The produce is in general larger, for it rarely happens that the whole of the colour is not extracted at first; when otherwise it must have been removed from the fire too soon.—To be fully master of this department of the art, requires very little practice; whereas, by fermentation, the leaves will yield Indigo upon being fermented a second time. See translation of M. De Cossigny's Treatise on Indigo, pages 145 and 146.

2.—The health of the labourers is not endangered by the effluvia of the manufacture; whereas, from the fermentation, much putrid miasma are constantly exhaling.

3.—The heat employed expels most of the fixed air during the scalding, which renders a very small degree of agitation, and very little of the precipitant sufficient *.

4.—The operation can be performed two or three times daily upon a large scale, which is a very material advantage.

5.—The Indigo dries quickly, without acquiring any bad smell, or putrid tendency, which is always dangerous to health.

6.—Indigo, so prepared, has never that flinty appearance common to fermented Indigo; but in softness and levity is like, or even superior to Spanish Flora.

Explanation of the Engraving of Nerium Tinctorium, Plate 17.

A small branch of the plant is shown in flower.

* M. De Cossigny says, that the Javanese first ferment the plant, then boil a little of the coloured liquor before agitated, and do not seem to make use of any other agent to assist the granulation and precipitation. And that the Indigo itself is very fine, and much esteemed in Europe, which I attribute to boiling alone, probably scalding.

Explanation

Nerium Indigo Works.

Fig. 3.

Transverse Section.

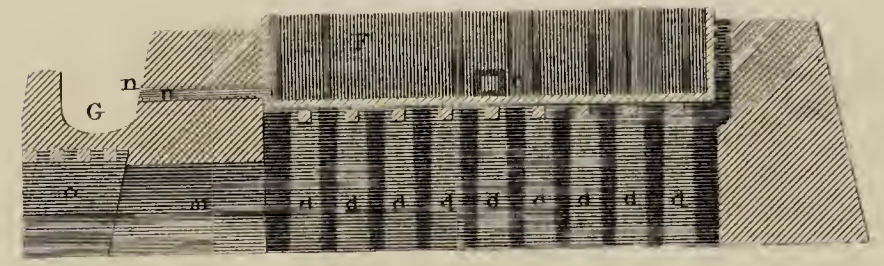


Fig. 4.

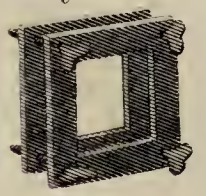


Fig. 2.

Longitudinal Section.

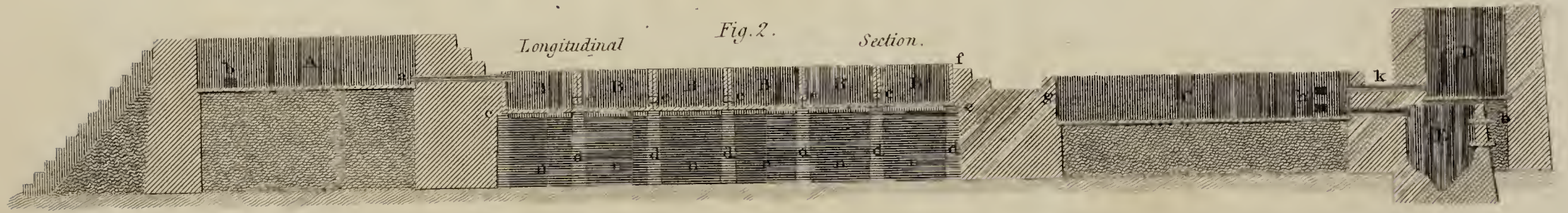
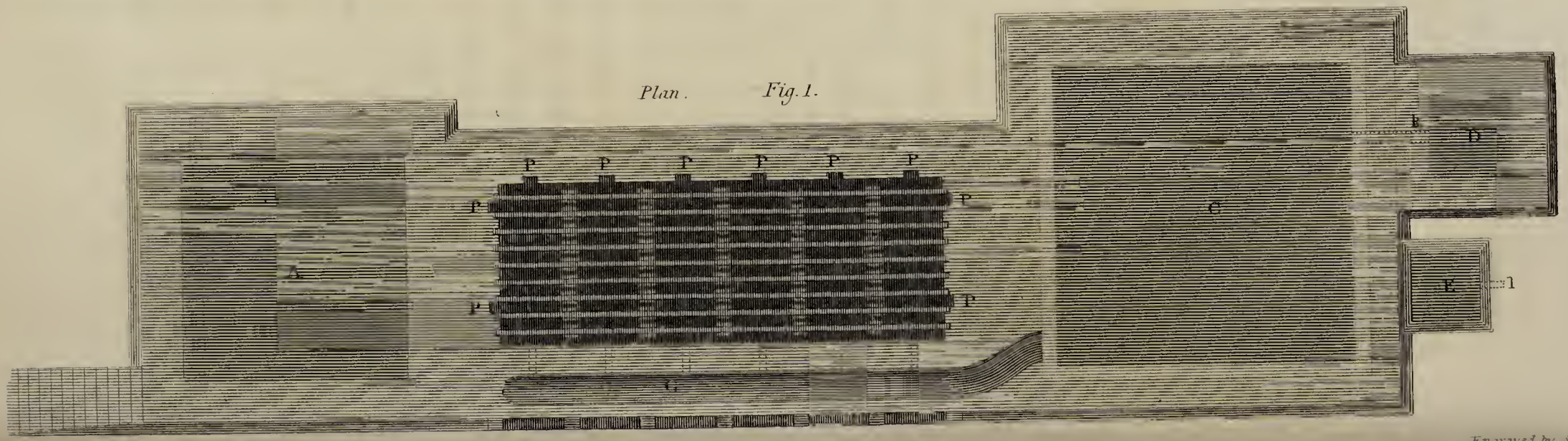


Fig. 1.

Plan.



Engraved by S. Porter.

Explanation of the Figures in the Drawing of the Nerium Indigo Works, Pl. 17 *and* 18.

Fig. 1, pl. 18, the plan, taken at the grate, or iron bars which support the coppers over the fire. The letters are the same as are explained under fig. 3.

Fig. 2, a longitudinal section, which exposes to view the structure of the works.

A, a cistern for holding water in readiness to fill the coppers. It is fifteen feet square, and three deep. *a*, the channel for conducting the water from the cistern into the coppers, which is about two inches above the bottom that any impurities may settle at the bottom; *b*, a channel for the impurities to be drawn off at, and for the cistern to be cleaned.

To raise the water to fill this cistern, is an object of much consequence; in several places amongst the hills, where the *Nerium* grows, there are little rills of water, running upon such a descent as to render it only necessary to construct the works on some low, adjacent spot, that the water may be conducted, with little trouble, into the cistern. When no such supply of water can be had, pecotahs, or a chain pump, made of four boards, as described, and figured in the Encyclopædia Britannica, article *pump*, may be used, or if the water is very low, it may be done with the funnel-like leather bucket, which is wrought by a pair of buffaloes, or bullocks, backing to lower the bucket, &c. To the mouth of the tube, or pipe of this leather funnel-bucket, see *x*, plate 17, is fastened a cord *a*, which leads over a roller, at least, the length of the body of the bucket below the wheel V, over which the rope *y* that raises it passes; and immediately above the trough *s*, by which the water is conducted to the cistern. The cord *w*, is of a length sufficient to keep the mouth of the pipe rather above the square

mouth

mouth of the bucket, until it reaches the roller, which it passes over, leading it into the trough, while the bucket continues to ascend, till its bottom is about the level with the trough, by which time the whole of the water will have made its escape within the trough. This method of raising a large quantity of water from a great depth, is in common use over many parts of Hindostan, where the wells are too deep for the pecotah, or lever. It is of great advantage to have the water in readiness in this manner, for it not only forwards the work much, but also gives time for any impurities to settle at the bottom. In the perspective view the cistern A is omitted, to shew the other parts of the works on a larger scale.

B, the coppers, or scalding vessels. Here they are cut transversely, resting on the grate *c*, which is supported by the walls, and by the pillars *d*. They are made to communicate with each other at the openings *e*; *f* shows the top of the walls which surround the vessels. It is two or three inches lower than the edges of the coppers, to prevent dust, &c. getting in, and sufficiently broad for the workmen to walk about on, to attend the work; *n*, the fire-places.

C, the agitation vat, or beater, twenty feet square, and three deep; one foot of which, *g*, may be called the border, being thinner, and prevents dust and dirt getting in from the feet of the workmen, while walking about to agitate the liquor, &c. *h* two scuppers for letting off the clear supernatant liquor from the fecula; *i*, another to draw off the fecula by.

D, the lime-water cistern, which may be made with a border and lid to exclude the air, or arched, having an opening to put the lime and water in at, and for a boy to go in to clean it. The closer this can be shut, the better will the lime-water be: *k*, the scupper for letting the lime-water into the agitation vat.

E, the

E, the small fecula cistern for the fecula to further settle in: *l*, scuppers to let off the supernatant liquor, and over them the bags are hung till the liquor drops clear from them.

Note, in this section the fecula and lime-water cisterns seem one over the other, but by the plan (fig. 1, pl. 18,) their real places are seen.

Fig. 3, a transverse section, upon a larger scale than the former. It is through the middle of one of the coppers F; and through the middle of one of the arched openings, *m*, pl. 17, which serves to feed the fire. This shews the channel G for carrying the scalded liquor from the boilers, to the agitation vat C, figs. 1 and 2; it is supported by four beams of wood extended between the abutments *n*; one of the scuppers, by which the liquor runs from the coppers to the channel G; *d* are the pillars which support the grate, or square bars of iron; *q*, the opening which communicates with the next copper. To prevent any leakage at these communications, and to be able to separate the vessels, I made use of the following contrivance; it is represented at fig. 4.

Fig. 4, holes are made in the sides of the two contiguous coppers corrresponding with the four screws. A thick square piece of welted hide, with a square hole corresponding with the holes in the sides of the vessels, is slipped in between them, and the two plates of iron are then placed one in each copper, and screwed very tight together. This I have found perfectly convenient, and adequate to the purpose.

Fig. 2, pl. 17, are two of the beaters, each being a square-headed churn-staff, which answers exceedingly well to turn the leaves while scalding, and afterwards to agitate the liquor with; four of them I have found sufficient for the above-described vat.

N. B.

N. B. If workmen for joining the sheathing copper can be had, where the works are to be erected, it would be a great saving of copper, and otherwise more convenient, to have only one vessel; the length may be made as much as may be necessary for the quantity of leaves that may grow in the vicinity of the place. If constructed in this manner, there will be no need of the channel G in front of the vessels, one large scupper from the end of the vessel next the agitation vat, is all that can be necessary. The other parts may remain as above-mentioned. I am now joining my fore-described six vessels into one, by cutting out the divisions, and joining them upon the grate; with the copper so got from the sides cut out I lengthen the now single vessel to be more than forty feet; which will require two additional fire-places, as I conceive a fire for every five feet in length little enough, when the vessel is ten feet broad; which is a surface of fifty square feet for each fire to act on.

Description of a second newly-discovered Indigo Plant, of the same Genus, or Family, (Indigofera, on account of its bearing or yielding Indigo,) to which the sort in common use belongs; with the process for extracting the Indigo, and to distinguish it from Tinctoria, the common kind, and at the same time be expressive of its most predominant quality: I have called it,

INDIGOFERA, *Cærulea, Roxb.*

Shrubby, erect, hoary.—Leaves pinnate: leaflets from three to five pair; obovate emarginate racemes, shorter than the

the leaves. Legumes reflex, cylindric, curved to rose, hoary three, four seeded.

Carneeli of the Telingas.

This is an erect, shrubby plant, found growing on dry, barren, uncultivated ground, to the height of from one to three feet;—when reared in a good garden soil considerably larger. It flowers during the wet and cold seasons; and the seeds are ripe in about three months.

Description of the Plant.

Stem—erect, woody, as thick as a man's thumb, or more; perennial; height very various, but the whole plant in its wild state is generally about three feet high; when cultivated in a good soil, in my garden, it is often five or six feet high. *Branches*—many, nearly erect, scattered, striated from the insertions of the leaves, three small ridges running down from each, entirely covered with infinite numbers of short, depressed white hairs, which make the plant quite hoary: these may be easily rubbed off, leaving the branches, &c. smooth and green.

Leaves—alternate, somewhat bifarious, numerous, approximate, pinnate, with an odd one; about four inches long. *Leaflets*—short-petioled, opposite; from three to five pair, pale, green, fleshy; the lower smallest; all are obovate, slightly emarginate, with a minute bristle; above pretty smooth, but pale coloured; many, short, oppressed, white hairs cover the underside, which makes it still a fainter green than the upper side; (but nothing like down on any part of the plant;) they are from one to two inches long, and about three-quarters thereof in breadth.

Petioles

Petioles—covered with the same small oppressed white hairs channeled.

Stipules—subulate, small.

Racemes—axillary, solitary, sessile, erect, shorter than the leaves, many-flowered.

Flowers—numerous, small, yellow and red mixed.

Calyx—five toothed; divisions short, acute, equal.

Banner and *Keel*—hairy, greenish-yellow; margins of the former involute.

Wings—pale rose colour, linear oblong. Processes of the keel remarkably large.

Legumes—numerous, reflex, falcate, round, short, covered with the same hairs, the branches, &c. are contracted between the seeds.

Seeds—generally three, smooth, like those of Indigo tinctoria.

From the leaves of this plant I have often extracted a most beautiful light Indigo; more so than I ever could from the common Indigo plant, or from Nerium tinctorium; and in a large proportion.

After an enquiry of some years, I have not been able to discover that the natives of any part of India make any use of this plant.

The process by which I obtained the colour from the leaves, was exactly similar to that practised for obtaining the Indigo from the leaves of Nerium tinctorium, viz. by committing them while fresh to cold water, and scalding them over a moderate fire, to about one hundred and sixty degrees of Fahrenheit's thermometer. The liquor will then have attained a beautiful deep greenish-yellow colour. It is then poured, or strained off clear, and while hot gently agitated in a broad shallow open vessel for 20 or 30 minutes, during which time it changes its colour, gradually becoming

becoming darker and more turbid; when sufficiently agitated, if a little of it be viewed in a clean silver spoon, or other vessel that reflects the light, a muddiness or minute grains may be easily seen; which are rendered large and copious, by the addition of a little lime-water; in which state they readily fall to the bottom. The superincumbent liquor is then poured off, and will be more or less of a clear brandy-colour, according as the operation has been successfully conducted; for the more this liquor is tinged with green, the less perfectly has the colour been separated, and the produce of course the more deficient, and less beautiful. How to effect the most perfect separation and precipitation of the colour, is the grand desideratum with our Indigo manufacturers, and well deserves the Chemist's most serious attention.

Out of various experiments upon the leaves of this plant, the following will be sufficient to illustrate the process:—

September 1, 1792, I scalded eight pounds of the leaves of Indigo cœrulea, in the hard-water mentioned in the first part of this paper, and six pounds and a half in rain water. The operations were conducted as much alike as possible. I have observed, that these require more scalding than those of Nerium, or even of Indigofera tinctoria; for here they were particularly well scalded, till pretty yellow, yet the liquor was then of a less deep colour than it would have been with either of the other two above-mentioned. It also required more agitation to make it granulate; particularly that with rain-water, which, with all the three sorts, seems to act less effectually as a menstruum, than the hard-water. The proportion of lime-water here used, was in both one seventy-fifth part; that is, one of lime-water to seventy-five of the coloured liquor. The feculæ were mixed with a very little diluted acid of vitriol, which was washed off with scalding

soft water: when dry, they proved most beautiful Indigo. No. 1, (hard water) was considerably the best; but the proportion of Indigo was in both nearly the same, viz.

No. 1.	gave 241 grains, equal to	-	$\frac{1}{233}$
No. 2.	199 grains, equal to	-	$\frac{1}{230}$
	440 together, or		$\frac{1}{231\frac{1}{2}}$

The samples were sent to the Honorable Court of Directors by the Europa. I could have wished the quantity had been larger, but the scarcity of the plants, and a desire to preserve most of them for seed, prevented it.

I have not yet tried how these leaves are acted on by cold water; but if we may judge from analogy we may venture to conclude, that it will extract the colour, as well as it does from the leaves of the common Indigo plant. This Indigo did not crack, nor break in drying, but remained perfectly entire, and is of a firm texture, notwithstanding its incomparable levity.

January 23, 1793, after a long continuance of dry weather, and strong sea wind, I took seventeen pounds and a half of the leaves of Indigofera cœrulèa; some old, some young, and some of a middle age; scalded them in a twenty gallon earthen pot, in the usual way. (The pot was rather crowded with the seventeen pounds and a half.)

As before observed, these leaves require more scalding than those of Nerium. Two thirds of the liquor were taken off, when I judged it at a proper stage; the other third part I suffered to be highly scalded; both were agitated as with Nerium, and as soon as the grain was formed, I added a seventy-fifth part of lime-water. They both precipitated

but

but ill; as the supernatant liquor when poured off was very green. The fecula of both was once washed with a little vitriolic acid, in boiling water. The produce of the first taken off I marked 1, and that of the other 2. No. 1 was rather the finest of the two, a blue purple, and weighed two hundred grains. No. 2, dark blue-purple, and weighed one hundred and forty grains; together three hundred and forty, equal to $\frac{1}{3}\frac{1}{3}$. I conjecture nearly half of the colour remained dissolved in the supernatant liquor which was lost.

January 24, 1793, thirteen pounds of the leaves of Indigo cœrulea were scalded and agitated as usual, with the customary portion of lime-water; but still the supernatant liquor was a deep green; I therefore run it off into another pot, and agitated it for a few minutes, when it again granulated; lime-water was then added as before, by which means I procured nearly as much fecula as at first; half of the first fecula was washed with plain boiling water; it was marked 3. The other half with the help of a little acid; it was marked 4; and the fecula of the second agitation was also washed with the acid; it was marked 5.

	grains.
When dry, 3 was a very beautiful blue-violet, and weighed - - - -	230
4 was a very deep purple copper-blue, which I impute to its having had too much acid, it weighed	120
5 a very fine blue, in respect to appearance, it stands between 3 and 4, and is much more bulky than 3, although the same weight, which was -	230
	580

Here is double the produce of yesterday's experiments; a great portion of which was secured by the second agitation,

and is fully as good Indigo. The proportion here will be one of Indigo to one hundred and fifty-seven of leaves. Had none of it been washed with the acid, I think the produce would have been one of Indigo from one hundred of leaves.

January 25, 1793, twenty-three pounds and a half of the same leaves were scalded at twice in a twenty gallon pot, as usual; but I gave both a much greater share of agitation than is necessary for Nerium, or than I had ever done before with these leaves; in short till almost black, and the grain abundant, and by letting it stand a little in a cup, the liquor could be seen to have lost its greenness entirely. This was gaining a great point; the lime-water was now added; when the precipitate was formed the liquor run off a dark, clear brandy colour; both were washed with the acid, and the first with a second parcel of hot-water. The first scalding of this day, from twelve pounds of leaves, was marked 6. The second from eleven and a half was marked 7. When dry, No. 6, the produce of twelve pounds of leaves, was a most beautiful blue-violet-purple; I think the finest and lightest Indigo I ever saw, it weighed three hundred and eighty grains, equal to one of Indigo from two hundred and twenty-two of leaves. No. 7 weighed four hundred and twenty grains, equal to one of Indigo, from one hundred and ninety-two of leaves. This last (No. 7) had a whitish scurf over it, and when filterating had a blackish pellicle, which I do not well know what to impute to; but the Indigo itself was nearly as beautiful as No. 6.

The produce of the whole of the above three days experiments, came to one thousand seven hundred and twenty grains, from 54 pounds, or three hundred and eighty thousand one hundred and sixty grains of leaves, equal to one part of Indigo from every two hundred and twenty-one of the fresh gathered leaves. No part of the plant but the leaves

is

is here included, and I have every reason to think, that if the acid had not been used, and the fecula simply washed with the plain boiling water, the produce would have been at least a third more; for I could observe that No. 4 was washed with too much acid, which not only dissolved and carried off nearly half of the Indigo, but also left the remainder of by far too deep a copper-colour. It does not seem to me that this Indigo will require acid, or but a very little, for I think No. 3, where no acid was used, is as good as any of the rest, except No. 6.

January 28, 1793, I sent the greatest part of each sort to Mr. Ross, at Madras, to be forwarded by him to the Honorable Court of Directors, along with my description of the plant.

Description of a third Indigo Plant, viz. Asclepias tinctoria, Roxb.

Shrubby, twining. Leaves narrow cordate. Thyrses axillary, solitary, glomerate. Corol hypocrateriform, with tube rather longer than the oblong nectary, and organs of fructification.

Taroom-akkar, *Marsden's History of Sumatra*, p. 78.

This stately, useful creeper, is a native of the Island of Sumatra, and from thence introduced into the East India Companies Botanic Garden at Calcutta, previous to the year 1793, by the late Colonel Robert Kyd, I presume; and from thence it has been distributed over most parts of India, sent to St. Helena, Europe, America and the West Indies. In the Botanic Garden at Calcutta, and at Samulcotah, it

blossoms during the rains, but does not ripen its seeds in either place. In 1792 Colonel Kyd sent me plants to Samulcotah, where they grow luxuriantly.

Description of the Plant.

Root—ramous, &c. as in most other plants of a similar habit.

Stem—short, crooked, and much swelled at the joints; in old plants as thick as a man's wrist. *Bark*—dirty olive-colour, with small, lighter coloured, scabrous specks. *Branches*—twining when long, and leaning or scandent when short; their bark smoother than on the stem; young shoots round, and somewhat villous. When wounded, a clear pale yellowish-green liquid exudes, which soon thickens into the consistence of jelly, but in dry weather quickly evaporates, leaving scarcely a trace of its existence behind. When the tender shoots, or leaves are bruised, such parts become livid; a sign of the presence of Indigo.

Leaves—opposite, petioled, narrow-cordate, obtuse, or pointed, slightly villous, margins waved; from four to nine inches long, and from two to six broad. There are some small subulent glands on the upper side, close to the insertion of the petiole; these while young yield a waxy substance.

Petioles—round, from one to two inches long.

Stipules—none.

Thyrses—solitary, axillary, or between the leaves peduncled; as they become old interrupted, from their increasing length.

Flowers

Flowers—numerous, pedicelled, very small, yellow.

Bractes—minute.

Calyx—five-leaved.

Corol—funnel form. *Tube*—gibbous, rather longer than the nectary, and organs of fructification; mouth shut with long, silver-coloured hairs, which form a conic dome, round the apex of the common stigma. *Border*—flat, and cut into five oblique segments.

Nectary—sheathing the fructification, as in the other species of this extensive genus.

Anthers—five pair, and connected by as many short, fine, but firm filaments, to the five small, sharp, hard, black angles of the common stigma; their form is obliquely oval, like the body of a retort, while the filaments represent its neck.

Germs—two superior. *Styles*—two, short. *Stigmas*—proper, two, they are lodged in the base of the common stigma (corpus truncatum of Linnæus) which is of a succulent spongy nature.

Pericarp—I have not yet seen any of them ripe, but have no doubt of their being follicles. In these parts the plants are constantly raised from slips, or cuttings, which accounts for the seed not ripening.

The leaves of this plant yield Indigo, as mentioned by Mr. Marsden, in his history of Sumatra I have also extracted it from them, and with most success by scalding them in fresh water, till the heat, by Fahrenheit's thermometer, rose to about one hundred and fifty or one hundred and sixty degrees; when the liquor (now a deep clear green) was poured off, and if immediately agitated in the open air, soon became turbid; the more extended the surface while the agitation is going on, the sooner it becomes so. This muddiness, as I have already observed, is, I conjecture,

caused by a combination of the colouring principle of the plant, with oxygen, which it absorbs from the air. If the whole is now suffered to rest a short time, the coloured particles fall to the bottom, leaving the liquor, (if the operation has been properly conducted) of a clear brown colour, which is to be poured, or drawn off, and the blue fecula, dried, forms the Indigo.

If a little lime-water is added to the muddy liquor it hastens the granulation and precipitation of the colour; and with this view is very generally employed by Indigo manufacturers, and often saves time and trouble, and gives a larger produce.

The few experiments I have yet made with this plant do not enable me to say, with any degree of certainty, in what proportion they yield their colour. However, as the plant grows readily from layers, slips or cuttings, I think it very worthy of being cultivated, particularly as it is perennial, like the Nerium; so that a plantation once formed will continue for a number of years; and if I may hint at a comparison between the leaves of this plant, and those of the Nerium, I must observe that the quantity and the quality of the colour they yield will improve as they advance in age and size.

Description of a New Species of Asclepias, which is said to yield a green dye, viz.

Asclepias tingens, Roxb.

Shrubby, twining, bark of the old wood deeply cracked. *Racemes*—spiral. *Nectary* and organs of fructification trochlear

leari cylindric. *Stigma*—oval, crowning the tube of the corol.

A large, twining, shrubby plant, brought from Pegu by Dr. Buchanan in 1795, to the Botanic Garden at Calcutta, where it thrives well, blossoms in June, and the seeds are ripe the following May.

Description of the Plant.

Stems—in six or eight years, as thick as a man's wrist. *Bark*—thereof suberous, and deeply cracked. *Branches*—twining, more or less smooth, according to their age, extending up and over trees, or whatever supporters they meet with.

Leaves—opposite, petioled, cordate, entire, cuspidate, smooth on both sides, from three to six or more inches long, and from two to five broad.

Petioles—about an inch long, channelled, smooth.

Racemes—sub-axillary, solitary, or in pairs, peduncled, while young umbelliform; but as they advance in age and length the slender, smooth, diverging pedicells are seen disposed spirally round the common peduncle.

Flowers—numerous, small, pale, yellow, or cream-colour, when they first expand, but grow gradually darker.

Calyx—to the base five cleft; segments oblong, obtuse.

Corol—hypocrateriform. *Tube*—short, cylindric, as long as the organs of fructification; on the inside run five double ridges, which are ciliate, with short brown hairs. *Border*—expanding; divisions obliquely oval.

Nectary—as in the genus, with the five simple membranaceous, cordate divisions of its mouth, covering the anthers and bottom of the common stigma only.

Anthers

Anthers—five pair, nearly erect, oblong, attached by very short filaments to the base of the five hard black receptacles round the base of the common stigma.

Germs—two. *Styles*—none. *Common Stigma*—smooth, pearl-coloured, oval, tapering much at the base; and round this part ten pits are found, corresponding with the ten anthers.

Follicles—ovate-lanceolate, rather obtuse, spreading smooth, and fleshy on the outside; length about four inches, and one in diameter, where thickest.

Seeds—many, thin, ovate, surrounded by a thin membranaceous edge, and crowned with a coma of soft, delicate white hairs. *Integument*—single, thin, brown.

Perisperm—conform to the seed, thin, white.

Embryo—straight, inverse. *Cotyledons*—thin. *Radicle*—pointing to the coma, which points to the apex of the follicle.

Dr. Buchanan, who brought the plants from Pegu, informed me, that from its leaves the Burmah people prepare a green dye. I hope those people did not forget to inform the doctor that it was necessary to dye the cloth yellow, or blue, either before or after the application of the colour prepared from the leaves of this plant, and that it may be found possessed of what has hitherto been considered a compound colour.

I have made a variety of experiments with a view of obtaining the green dye above-mentioned, but without success. It is therefore unnecessary to state them here. I am however inclined to think it proper to add the foregoing description, and an accompanying drawing, to my account of the *Indigo yielding plants*, described in this paper, that a vegetable, said to possess such a singular property, may be made known, particularly as the information is from so respectable a source

as

as to induce me to hope some person better qualified may be able to discover how this *green dye* is to be obtained and applied.

W. ROXBURGH.

From a subsequent communication by Dr. Roxburgh, inserted in the present volume, it will be found that the above accounts of various Indigo plants were only received last year from him, though his experiments were made several years before.—The Society have thought it better to preserve the chemical terms of this account in Dr. Roxburgh's own language than by modernizing them, perhaps to create confusion, as the subject in its present state is sufficiently clear. It is satisfactory to observe, by a reference to the title of this paper, that Dr. Roxburgh's predictions of the probability of immense quantities of Indigo being produced in the East Indies, have been since realized, and now form a considerable part of the Company's investments.

The

The THANKS *of the Society were voted to Dr.* WILLIAM ROXBURGH, *of Calcutta, for the following valuable Communications received from him. Samples of most of the Articles mentioned have been received, and are preserved in the Society's Repository.*

SIR,

I HAVE the pleasure to send you a quantity of my East India fever bark, discovered by me about fifteen years ago; since which period it has had numerous fair trials in many parts, which have been attended with every success that could be wished as a substitute for Peruvian bark, for which I first ventured to propose it.

A figure and description of the tree which furnishes this bark have been published under the name of *Swietania febrifuga*, in my account of Coromandel plants, vol. 1, page 18, table 17. It is a large timber tree, a native of the various mountainous parts of India. You will observe that this bark possesses an agreeable odour, and from numerous experiments which I have made with fresh bark, I have drawn the following conclusions:—

1. That the active parts of the bark of Swietania febrifuga are much more soluble than those of Peruvian bark, particularly in watery menstruums.

2. That it contains a much larger proportion of active, bitter and astringent powers than Peruvian bark.

3. That the watery preparations of this bark remain good much longer than similar preparations of Peruvian bark.

4. That

4. That the spirituous and watery preparations bear to be mixed in any proportion, without decomposition.

5. That this bark, in powder, and its preparations, are more antiseptic than Peruvian bark, or similar preparations thereof.

In my practice I generally gave from twenty to sixty grains of the fine powder in substance, either in wine or water, as circumstances required, and commonly as often as Peruvian bark is usually prescribed.

I recommend that some of this bark may be sent to the fenny countries, where intermitting fevers prevail, and if it is found to answer, which I have no doubt of, it may be imported from the East Indies at so low a rate as to render its use very general, on account of the high price of Peruvian bark.

I am, Dear Sir,

Your most obedient Servant,

W. ROXBURGH.

March 28, 1806.

To C. TAYLOR, M. D. SEC.

*** From experiments since made in England, the Swietania bark has been found a valuable medicine in intermittent fevers, scrofula, and in disorders usually termed nervous.

DEAR SIR,

I WROTE to you lately, along with my papers on the manufacture of Indigo, and of some newly-discovered plants which yield that drug.

It

It appears to me now that it will tend to a useful purpose to put the Society in possession of samples of a very cheap resin, the produce of one of our largest and best timber trees, called by the natives of Bengal, *Saul*, and by me, *Shorea robusta*. It is one of the substances used in our Indian naval yards under the general name *Dammer*, and is a substitute for pitch and tar. To bring it to a proper consistence for such use, it is boiled up with some cheap vegetable oil, (the Hindoos being forbid by their religion to use any animal oil), and more or less of the vegetable oil is added, according to the purpose for which it is wanted. The Society will probably find it also applicable to other uses, as it is a pure resin, cheap and plentiful: the price of it here is from three-halfpence to two-pence per pound. I wish to know whether it has been yet known in England, and whether it is likely to be in demand. It will probably be useful for making sealing-wax, and for varnish.

I am, my dear Sir,

Your's very obediently,

W. ROXBURGH.

Calcutta, Jan. 18, 1809.

To C. Taylor, M. D. Sec.

MY DEAR SIR,

I have now sent to you further samples of the resin of my Shorea robusta; and I have also sent a parcel of the black myrabolans, *(Myrabolanus Indica,)* the origin of which has hitherto been unknown. I believe that they are the unripe fruit

fruit of the same tree which produces the *Chebulic myrabolans*, and you will trace the cause of my now having discovered the tree which produces them in part 3 of the eleventh volume of the Asiatic Researches, containing a catalogue of Indian medicinal plants and drugs. with their names in the Hindustani and Sanscrit languages, by John Fleming, M. D. pages 29, 30, and 3 , which the author sends to you for the Society. But though their medicinal virtues are in high repute over Asia, I do not send them to you with that view alone, but rather because I think they contain much *tannin* in little bulk, and may therefore be useful, and save the British oak plantations. I fear the gaub-extract, from the fruit of *Embryopteris glutinifera*, which I sent you some time since for the trial of the tanners, may not have answered so well as I expected, otherwise that you would have applied for more of it.

I take the present opportunity to request you will correct a mistake in my letter of June 18, 1804, published in the 23d volume of the Society's Transactions, page 408, where I said *hurra* was the fruit of *terminalia citrina*; I now find it is the fruit of *terminalia chebula*.—See Coromandel plants, 2, No. 197, and of Wildenow's edition of the Species of Plantarum, 4.969. I now send to you a drawing and description of the tree, and of the myrabalans in their various stages, both fresh from the tree and dried as mentioned by Dr. Fleming. The small parcel within the other contains some of the drug purchased in the Bazar, viz. four pounds weight, for which I paid one shilling. The remainder are fresh gathered from two trees in this garden, and hastily dried in the sun; they are rather advanced, and may answer to the fourth, fifth, and sixth sorts of the drawing; and amongst those of the Bazar will be found the three first. I have also sent you some more fever bark, part of

the

the produce of a young tree which grew in this garden. It is difficult to judge how long we may be conveniently supplied with Peruvian bark, and it is therefore very proper that this valuable substitute should be brought into general use as soon as possible, and if it is likely to meet with extensive demand, I will contrive that some of it be sent home for sale.

In the same package is inclosed some bark of a new species of *Brucea*, which is said to be a most powerful medicine; it is the *Lussa radga* of Rumphius's Herbarium Amboinensis, 7, p. 27, t. 15: it is a thin bark, and may probably be as good or better than *Simarouba*. In the same bundle is another parcel, which is the *Conessi bark* of our *Materia Medica*; it has an austere bitter taste, and is recommended in dysenteries, diarrhœas, &c. as an astringent *. I wish to receive the opinion of the Society on these and other articles which I have sent.

I am, my dear Sir,

Your's very obediently,

W. ROXBURGH.

Calcutta, Oct. 3, 1809.

To C. Taylor, M. D. Sec.

MY DEAR SIR,

Captain Richardson having been detained thus long, and this being the season for the gaub fruit, I have made a few

* See further particulars of this bark in Dr. Roxburgh's Treatise of Nerium Indigo, p. 254 of this volume, under the name of *Nerium Antidysentericum*.

pounds

pounds of the extract, which is packed in the same box with the articles mentioned in my former letter. At the bottom of the box there is ten pounds made with cold water. Immediately above it is another stratum, weighing six and a half pounds, made with hot water from the refuse left after the cold water process. These two parcels, with that I sent you formerly, will certainly enable the Society to ascertain and let me know what prospect of success this extract holds out to your tanners. I request the Society will order experiments to be made therewith as early as possible, and I anxiously wait for letters from you acquainting me with the result.—I remain, dear Sir,

Your's truly,

W. ROXBURGH.

Calcutta, Nov. 21, 1809.

To C. TAYLOR, M. D. SEC.

*** Samples of the several articles above-mentioned will be delivered for trial to such persons as will engage to favour the Society with the result of their experiments thereon.

The THANKS *of the Society were voted to Dr.* ALEXANDER ANDERSON, *of the Royal Botanical Garden at St. Vincent, for the following interesting Communications received from him respecting the Plants in that Garden.*

DEAR SIR,

I HAVE great pleasure in informing the Society that lately I have obtained some valuable acquisitions from the liberal

and patriotic views of Admiral Sir Alexander Cochrane, who in the beginning of August sent a ship here to take me on board, or such person as I thought proper to send, to proceed direct to Cayenne, to procure every useful plant it afforded that was wanted for this garden.

It being the commencement of the hurricane months, I found it improper to leave the garden for three months, particularly as the house is in a ruinous state for want of repairs; but my friend and fellow-labourer, Mr. Lockhead, went from Trinidad in my stead. From his knowledge of the Portuguese language he was indeed fitter than me for that service. My great desideratum from that quarter was to obtain the nutmeg-tree, as the one I have in this garden is a male, and of no use alone. I had no doubt but an ample supply would be readily got from the present possessor of that colony, and the Captain of the vessel carried a very polite letter from the Admiral to the Governor there; but such was his illiberal and ungenerous conduct, that he gave neither aid nor countenance towards our obtaining an individual plant of any kind. Fortunately Mr. Lockhead met with a French botanist, from whom he procured three young nutmeg trees, and from his perseverance, combined with that of Captain Dix, of the Cygnet, they brought with them four large boxes full of plants, several of them valuable, amongst which were the *Heveaguianensis* of Aublet, (the *Caoutchouc*, or gum-elastic tree,) several clove plants, black pepper, couma, and bagossa, (Aublet,) some palms, fruits, esculents, &c. To counter-balance the disappointment at Cayenne, Mr. Lockhead generously made me a present of two very fine young nutmeg trees, which he had nursed in Trinidad for three years. Immediately after his return from Cayenne, Captain Dix went to Trinidad and brought them here in a flourishing state, so that if no accident happens to them, they will produce fruit about two years hence.

At

At present the garden possesses six nutmeg trees. I cannot avoid mentioning the great obligation this garden is under to Captain Dix, of his Majesty's ship Cygnet, who instantly embraced the service, when proposed by the Admiral, and used every exertion in his power for the full accomplishment of the Admiral's good intentions.

I am, with great regard, dear Sir,

Your obliged and very humble Servant,

ALEXANDER ANDERSON.

Botanic Garden, St. Vincent, Aug. 21, 1809.

To C. Taylor, M. D. Sec.

DEAR SIR,

I am unable to express my gratitude to the Society for the honour they have done me at different times, and their united interest for obtaining the late allowance from Government to me. It will be my greatest ambition to merit their esteem; your individual friendship has been long known to me.

The two young nutmeg trees from Trinidad are at present in a prosperous state. The true Ipecacuanha plant is a great desideratum with me; and as the communication between England and the Brazils is now open, I should hope that it might be obtained through the influence of Sir Joseph Banks. I wish for information whether the Columbo plant has yet been brought to England from Ceylon, and whether the plant is clearly ascertained by botanists.

I am, with great regard, dear Sir,

Your much obliged Servant,

ALEXANDER ANDERSON.

Botanic Garden, St. Vincent, July 23, 1810.

To C. Taylor, M. D. Sec.

*** By letters from St. Vincent, under date of August, 1810, from Dr. Anderson, Mr. George Young, Mr. J. Sutherland, and Mr. D. Questel, the Society have received information, that on opening a box of plants, sent from London by Mr. Salisbury to St. Vincent, packed in the *Sphagnum palustre*, in the manner mentioned by him in the 27th volume of the Society's Transactions, that the moss appeared to be in a perfect state of vegetation, and of a yellowish green colour on its arrival; that the plants had many of them shot out from their stems, particularly the apple plants, and some from the roots; that the carnations were decayed, and that some of the other plants appeared somewhat injured; but upon the whole they might be esteemed in high preservation; that this is the more to be considered as they must have been taken up in a very unfavourable season for the experiments: they further observe, that the iron wires, with which the labels had been fixed, were corroded and destroyed; they therefore recommend that the labels be attached in future with brass-wire, at least as thick as the largest string of an harpsicord. They add, that from the fresh appearance of the moss they purposed to pack in it some of the plants of that Island, and send them to England.

STEREOTYPE PRINTING.

The GOLD MEDAL *of the Society was this Session voted to* Mr. ANDREW WILSON, *of the Stereotype Office, near the Veterinary College, St. Pancras, (late of Duke Street, Lincoln's Inn Fields,) for his great skill and exertions in the Art of Stereotype Printing. The following Communication was received from him, printed* in Stereotype, *as a specimen of this Art; and the Stereotype Plates of the article itself are preserved in the Society's Repository, for the inspection of the Public.*

SIR,

IN conformity with a Resolution of the SOCIETY of ARTS, of the 24th May last, "That Mr. Wilson be re- "quested to furnish such particulars respecting the Art of "Stereotype Printing as he may think necessary or proper, "as materials for duly noticing the Art in the next volume "of the Society's Transactions;" I beg leave to trouble you with the present communication, in the hope that the candour of the numerous members of the Society will be exercised towards me, wherever my abilities in complying with the desire expressed in the said Resolution may appear to require it.

Anxious, Sir, to excel in my profession, and animated by the prospect of acquiring some credit with the Literary World, I was induced, in the early part of the year 1802, to engage in a scheme of perfecting, and establishing in this country, the important art of Stereotype Printing. An undertaking of such magnitude, involving a risk of property and an anxiety of mind which few individuals will be found disposed to encounter,—but at the same time fraught with incalculable public advantages,—such an undertaking, I conceived, would not be unworthy the fostering attention and support of those great Public Bodies, the general basis of whose institutions is Literature itself, and whose wealth and prosperity are more immediately dependent upon the success of every art connected therewith. It seemed to introduce a new æra in the History of Literary Science, in its nature and consequences little inferior to that of the invention of Printing by moveable types; and, as such, to possess a well-founded claim upon the patronage and encouragement of every friend to his country, of every wellwisher to the civil and religious liberties of mankind.

These early ideas do not appear to have originated from a misconception of the true interests of society: for it is with no small degree of pride, (a pride which, I trust, will not be censured by those who admire gratitude for its own sake,) that I record in your *Transactions* my acknowledgments of the liberal patronage bestowed upon me by THE TWO UNIVERSITIES of ENGLAND, as well as of the distinguished honour recently conferred upon my skill and perseverance by the SOCIETY of ARTS,—an institution which yields to none in Europe for its scientific knowledge, usefulness and independence.

The advantages arising from an application of the Stereotype invention to the manufacture of books, are not confined to any particular department of the printing business. In every department of expenditure they are equally self-evident and profitable; and need only to be mentioned, to be well understood.

1*st*, The expenses of *Case-work*, *Reading*, and *Editing*, are nearly the same in the Stereotype and common method, for a first edition; but, while all these must be *repeated* for *every succeeding edition* from moveable types, by the Stereotype plan *they cease with the first edition.*

2*dly*, The expenditure upon *Paper* and *Press-work* is the same by both plans; but it is not incurred at the same time. The old method requires an advance of capital for a consumption of three or four years; whereas, by the Stereotype, half a year's stock is sufficient. It follows, therefore, that about 15 *per cent.* of the capital hitherto employed in paper and press-work, is fully adequate to meet an equal extent of sale.

3*dly*, A fire-proof room will hold Stereotype plates of works, of which the dead stock in printed paper would require a warehouse twenty times the size; and thus *warehouse-rent* and *insurance* are saved;—with this additional advantage, that in case of accident by fire, the Stereotype plates may be instantly put to press, instead of going through the tedious and expensive operations of moveable-type printing; and thus no loss will be sustained from the works being out of print.

4*thly*, In Stereotype, every page of the most extensive work has a separate plate: all the pages, therefore, of a work, must be *equally new and beautiful.* By the old method, the types of each sheet are distributed, and with them the succeeding sheets are composed; so that, although the first few sheets of a volume may be well printed, the last part of the same volume, in consequence of the types being in a gradual state of wear as the work proceeds, must be executed in a very inferior manner.

5*thly*, The Stereotype Art possesses a *security against error*, which must stamp every work so printed with a decided superiority of character. If, after all the care and attention that competent and industrious Editors can bestow, some errors should still escape observation in a first edition, it is a pleasing satisfaction to know that these may be corrected as they are discovered, without any injury to the plates, and with such perfect nicety that the most acute eye cannot

discern where an alteration has been made. Thus, in all Stereotype books, the *imperfections*, if any, of a first and small impression, may be easily and speedily rectified; whilst its *perfections* remain undisturbed in all future impressions; and of course all *accumulation* of error in each succeeding edition is entirely precluded. And what an important security it is, that the numerous train of incidental mistakes which are continually occurring in the printing of works by moveable types, *and to which every new edition superadds its own particular share of error*, may thus be completely remedied by the Stereotype invention!

The Editor of Walker's Pronouncing Dictionary, in his Preface to the Stereotype Edition of that work, has done ample justice to this part of the subject; and I quote his words, therefore, without the affectation of an apology for taking such a liberty: "This work," he says, "after so many degrees of improvement, was thought worthy of being *stereotyped*, in order to give stability and permanence to the pronunciation of a language now spoken in most parts of the known world. To effect that correctness so necessary and desirable, my coadjutors, Mr. Wilson and his assistants, have paid unremitting attention, and co-operated with me entirely to my wish. It is therefore presumed that the Public will find this edition possessed of an uncommon degree of typographical exactness. This most important advantage will be *perpetuated*, by means of the Stereotype; for it is an admirable feature of this modern improvement in the art of printing, that the labours of learned and ingenious men *will be thereby protected from the accumulation of errors* inseparable from moveable types. This superiority of the Stereotype method of printing is of the greatest consequence with respect to all works which, like this volume, are of a nature difficult to be executed with even humble claims to accuracy."

Lastly, I have reason to believe, that the Stereotype plates I have hitherto manufactured, will yield at least three times the number of impressions that moveable types are capable of producing.

From the whole, it results, that a saving of 15 to 40 *per cent.* will accrue to the Public, in the prices of all books of standard reputation and sale. This decisive fact will more clearly appear from an examination of the comparative expense of the *British Essayists*, a Stereotype edition of which I have advertised in 30 pocket volumes at 6*l.* per copy, which will comprise all the matter contained in the London Booksellers' edition of 45 volumes, the price of which is marked in their catalogues at 10*l.* 10*s.*

It is fair to conclude, therefore, that the sales of all works of established reputation will be considerably increased, and that the duties on paper will be proportionally productive; so that the Public will be benefited in a twofold way by a general adoption and encouragement of the Stereotype art.

Having resolved to unite the business of a Stereotype *Bookseller* to those of a Stereotype *Manufacturer* and *Printer*, I propose that Great Britain and Ireland shall be supplied with various Series of the best and most approved standard books in every department of Literature, equally combining accuracy and elegance with usefulness and economy. These Series will comprise Stereotype Editions of

GREEK, LATIN, FRENCH, and other DICTIONARIES, of most approved and general use;
The DELPHIN CLASSICS, and all SCHOOL-BOOKS of value and in general demand;
POPULAR BIBLICAL and THEOLOGICAL WORKS;
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ELEGANT EXTRACTS, upon a new and improved plan;
BRITISH HISTORICAL AUTHORS, comprising the Works of HUME, SMOLLETT, ROBERTSON, GIBBON, &c. &c.;
And all other Works of Taste and general Literature interesting to the rising generation.

I am far from being sanguine enough to believe, that in editing and revising so extensive a circle of Literature, some few errors may not occasionally escape the observation of the most correct Reader, and the most accurate Editor; but as Stereotype plates, which are cast with much more facility and perfection than moveable types, admit almost as easily of correction, I shall feel grateful to every Gentleman who will take the trouble of pointing out to me such inaccuracies as

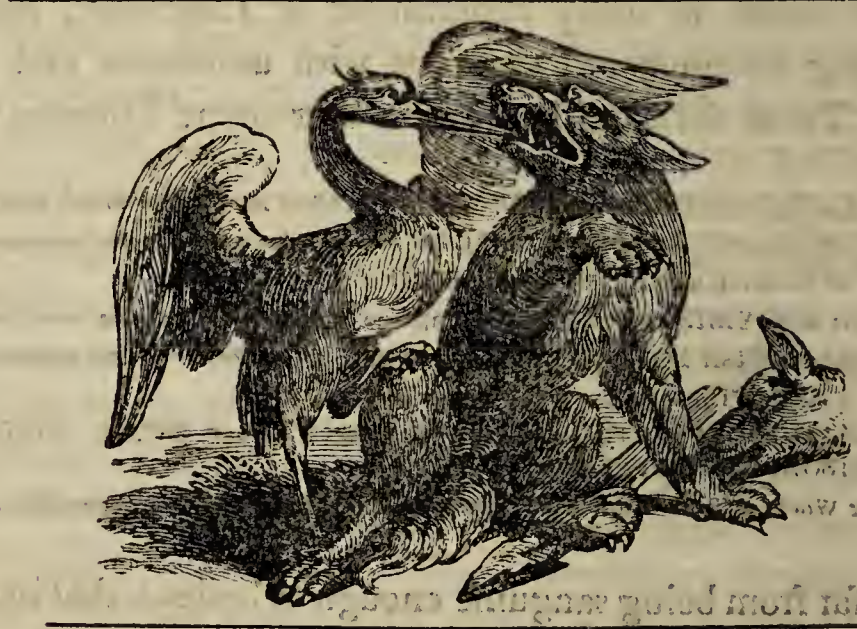
he may happen to discover in any Stereotype book which I have published; by which means, in the course of a very few small impressions, the Public will actually be put in possession of that grand desideratum, "*immaculate editions*" of works even of the most laborious and difficult execution.

I have the honour to be, SIR,

Your obedient, humble Servant,

And^w Wilson

To CHARLES TAYLOR, M. D. *Sec.*



P. S. *The following two pages are specimens of NONPAREIL and PEARL STEREOTYPE; and are here given, for the purpose of shewing the beautiful perfection with which solid pages of even the smallest types may be cast.*

NONPAREIL STEREOTYPE.

HONOUR.—Every principle that is a motive to good actions ought to be encouraged, since men are of so different a make, that the same principle does not work equally upon all minds. What some men are prompted to by conscience, duty, or religion, which are only different names for the same thing, others are prompted to by honour. The sense of honour is of so fine and delicate a nature, that it is only to be met with in minds which are naturally noble, or in such as have been cultivated by great examples, or a refined education. This essay, therefore, is chiefly designed for those who, by means of any of these advantages, are, or ought to be, actuated by this glorious principle. But as nothing is more pernicious than a principle of action when it is misunderstood, I shall consider honour with respect to three sorts of men. First of all, with regard to those who have a right notion of it. Secondly, with regard to those who have a mistaken notion of it. And, thirdly, with regard to those who treat it as chimerical, and turn it into ridicule. In the first place, true honour, though it be a different principle from religion, is that which produces the same effects. The lines of action, though drawn from different parts, terminate in the same point. Religion embraces virtue, as it is enjoined by the laws of God; honour, as it is graceful and ornamental to human nature. The religious man fears, the man of honour scorns, to do an ill action. The latter considers vice as something that is beneath him; the other, as something that is offensive to the Divine Being: the one, as what is unbecoming; the other, as what is forbidden. Thus Seneca speaks in the natural and genuine language of a man of honour, when he declares, that were there no God to see or punish vice, he would not commit it, because it is of so mean, so base, and so vile a nature....In the second place, we are to consider those who have mistaken notions of honour. And these are such as establish any thing to themselves for a point of honour, which is contrary either to the laws of God or of their country; who think it more honourable to revenge than to forgive an injury; who make no scruple of telling a lie, but would put any man to death that accuses them of it; who are more careful to guard their reputation by their courage than by their virtue. True fortitude is indeed so becoming in human nature, that he who wants it scarce deserves the name of a man: but we find several who so much abuse this notion, that they place the whole idea of honour in a kind of brutal courage; by which means we have had many among us who have called themselves men of honour, that would have been a disgrace to a gibbet. In a word, the man who sacrifices any duty of a reasonable creature to a prevailing mode or fashion, who looks upon any thing as honourable that is displeasing to his Maker or destructive to society, who thinks himself obliged by this principle to the practice of some virtues and not of others, is by no means to be reckoned among true men of honour. Timogenes was a lively instance of one actuated by false honour. Timogenes would smile at a man's jest who ridiculed his Maker, and at the same time run a man through the body that spoke ill of his friend. Timogenes would have scorned to have betrayed a secret that was intrusted to him, though the fate of his country depended upon the discovery of it. Timogenes took away the life of a young fellow in a duel, for having spoken ill of Belinda, a lady whom he himself had seduced in her youth, and betrayed into want and ignominy. To close his character, Timogenes, after having ruined several poor tradesmen's families who had trusted him, sold his estate to satisfy his creditors; but, like a man of honour, disposed of all the money he could make of it, in the paying off his play debts, or, to speak in his own language, his debts of honour....In the third place, we are to consider those persons who treat this principle as chimerical, and turn it into ridicule. Men who are professedly of no honour, are of a more profligate and abandoned nature than even those who are actuated by false notions of it, as there is more hope of a heretic than of an atheist. Those sons of infamy consider honour with old Syphax, in the play before mentioned, as a fine imaginary notion that leads astray young inexperienced men, and draws them into real mischiefs, while they are engaged in the pursuit of a shadow. These are generally persons who, in Shakespeare's phrase, "are worn and hackneyed in the ways of men;" whose imaginations are grown callous, and have lost all those delicate sentiments which are natural to minds that are innocent and undepraved. Such old battered miscreants ridicule every thing as romantic that comes in competition with their present interest, and treat those persons as visionaries who dare stand up in a corrupt age for what has not it's immediate reward joined to it. The talents, interest, or experience of such men, make them very often useful in all parties, and at all times: but, whatever wealth and dignities they may arrive at, they ought to consider, that every one stands as a blot in the annals of his country, who arrives at the temple of honour by any other way than through that of virtue. *Guardian.*

SATIRICAL WIT.—Trust me, this unweary pleasantry of thine will sooner or later bring thee into scrapes and difficulties, which no afterwit can extricate thee out of. In these sallies, too oft, I see, it happens, that the person laughed at considers himself in the light of a person injured, with all the rights of such a situation belonging to him; and when thou viewest him in that light too, and reckonest upon his friends, his family, his kindred and allies, and musterest up with them the many recruits which will list under him from a sense of common danger, 'tis no extravagant arithmetic to say, that for every ten jokes, thou hast got a hundred enemies; and, till thou hast gone on, and raised a swarm of wasps about thine ears, and art half stung to death by them, thou wilt never be convinced it is so. I cannot suspect it in the man whom I esteem, that there is the least spur from spleen or malevolence of intent in these sallies: I believe and know them to be truly honest and sportive; but consider, that fools cannot distinguish this, and that knaves will not; and thou knowest not what it is, either to provoke the one, or to make merry with the other: whenever they associate for mutual defence, depend upon it they will carry on the war in such a manner against thee, my dear friend, as to make thee heartily sick of it, and of thy life too. Revenge from some baneful corner shall level a tale of dishonour at thee, which no innocence of heart or integrity of conduct shall set right. The fortunes of thy house shall totter—thy character, which led the way to them, shall bleed on every side of it—thy faith questioned—thy works belied—thy wit forgotten—thy learning trampled on. To wind up the last scene of thy tragedy, Cruelty and Cowardice, twin ruffians, hired and set on by Malice in the dark, shall strike together at all thy infirmities and mistakes. The best of us, my friend, lie open there; and, trust me—when, to gratify a private appetite, it is once resolved upon that an innocent and a helpless creature shall be sacrificed, it is an easy matter to pick up sticks enough from any thicket where it has strayed, to make a fire to offer it up with. *Sterne.*

PEARL STEREOTYPE.

TRUTH and SINCERITY have all the advantages of appearance, and many more. If the show of any thing be good for any thing, I am sure the reality is better; for why does any man dissemble, or seem to be that which he is not, but because he thinks it good to have the qualities he pretends to? For to counterfeit and to dissemble is to put on the appearance of some real excellency. Now, the best way for a man to seem to be any thing, is really to be what he would seem to be. Besides, it is often as troublesome to support the pretence of a good quality, as to have it; and if a man have it not, it is most likely he will be discovered to want it, and then all his labour to seem to have it is lost. There is something unnatural in painting, which a skilful eye will easily discern from native beauty and complexion. It is hard to personate and act a part long; for where truth is not at the bottom, nature will always be endeavouring to return, and will betray herself at one time or other. Therefore, if any man think it convenient to seem good, let him be so indeed, and then his goodness will appear to every one's satisfaction; for truth is convincing, and carries it's own light and evidence along with it, and will not only commend us to every man's conscience, but, which is much more, to God, who searcheth our hearts. So that upon all accounts sincerity is true wisdom. Particularly as to the affairs of this world, integrity hath many advantages over all the artificial modes of dissimulation and deceit. It is much the plainer and easier, much the safer and more secure way of dealing in the world; it has less of trouble and difficulty, of entanglement and perplexity, of danger and hazard in it; it is the shortest and nearest way to our end, carrying us thither in a straight line, and will hold out and last longest. The arts of deceit and cunning continually grow weaker, and less effectual and serviceable to those that practise them; whereas integrity gains strength by use, and the more and longer any man practiseth it, the greater service it does him, by confirming his reputation, and encouraging those with whom he hath to do, to repose the greatest confidence in him, which is an unspeakable advantage in business and the affairs of life. A dissembler must always be upon his guard, and watch himself carefully, that he do not contradict his own pretensions; for he acts an unnatural part, and therefore must put a continual force and restraint upon himself: whereas he that acts sincerely hath the easiest task in the world; because he follows nature, and so is put to no trouble and care about his words and actions; he needs not invent any pretences beforehand, or make excuses afterward, for any thing he has said or done. But insincerity is very troublesome to manage; a hypocrite hath so many things to attend to, as make his life a very perplexed and intricate thing. A liar hath need of a good memory, lest he contradict at one time what he said at another: but truth is always consistent with itself, and needs nothing to help it out; it is always near at hand, and sits upon our lips; whereas a lie is troublesome, and needs a great many more to make it good. Add to all this, that sincerity is the most compendious wisdom, and an excellent instrument for the speedy dispatch of business. It creates confidence in those we have to deal with, saves the labour of many inquiries, and brings things to an issue in few words. It is like travelling in a plain beaten road, which commonly brings a man sooner to his journey's end than by-ways, in which men often lose themselves. In a word, whatever convenience may be thought to be in falsehood and dissimulation, it is soon over; but the inconvenience of it is perpetual, because it brings a man under an everlasting jealousy and suspicion, so that he is not believed when he speaks truth, nor trusted when perhaps he means honestly. When a man hath once forfeited the reputation of his integrity, nothing will then serve his turn, neither truth nor falsehood. Indeed, if a man were only to deal in the world for a day, and should never have occasion to converse more with mankind, never more need their good opinion or good word, it were then no great matter (as far as respects the affairs of this world) if he spent his reputation all at once, and ventured it at one throw. But if he be to continue in the world, and would have the advantage of reputation while he is in it, let him make use of truth and sincerity in all his words and actions; for nothing but this will hold out to the end. *Tillotson.*

MODESTY and ASSURANCE.—I know no two words that have been more abused, by the different and long interpretations which are put upon them, than these. To say, such a one is a modest man, sometimes indeed passes for a good character; but at present is very often used to signify a sheepish awkward fellow, who has neither good breeding, politeness, nor any knowledge of the world. Again, a man of assurance, though at first it only denoted a person of a free and open carriage, is now very usually applied to a profligate wretch, who can break through all the rules of decency and morality without a blush. I shall endeavour, therefore, in this essay, to restore these words to their true meaning, to prevent the idea of modesty from being confounded with that of sheepishness, and to hinder impudence from passing for assurance. If I was put to define Modesty, I would call it, The reflection of an ingenuous mind, either when a man has committed an action for which he censures himself, or fancies that he is exposed to the censure of others. For this reason, a man truly modest is as much so when he is alone as in company, and as subject to a blush in his closet, as when the eyes of multitudes are upon him.—I take Assurance to be, The faculty of possessing a man's self, or of saying and doing indifferent things without any uneasiness or emotion in the mind. That which generally gives a man assurance, is a moderate knowledge of the world, but above all, a mind fixed and determined in itself to do nothing against the rules of honour and decency. An open and assured behaviour is the natural consequence of such a resolution. A man thus armed, if his words or actions are at any time misinterpreted, retires within himself, and, from a consciousness of own integrity, assumes force enough to despise the little censures of ignorance or malice. Every one ought to cherish and encourage in himself the modesty and assurance I have here mentioned. A man without assurance is liable to be made uneasy by the folly or ill nature of every one he converses with. A man without modesty is lost to all sense of honour and virtue. *Spectator.*

Stereotyped and printed by A. Wilson,
Camden Town, St. Pancras.

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